ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

Vol. 11 No. 20. WEEKLY. NEW YORK, SATURDAY, JANUARY 14, 1888. $3 per annum. Single Copies, 6 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

Getting Ready for the Electric Light Convention.

The Executive Committee of the National Electric Light Association met Friday, January 6, at the office of J. F. Morrison, Esq., 11 South street, Baltimore. There were present Messrs. J. F. Morrison, president of the association, A. J. De Camp, of Philadelphia, vice-president; S. A. Duncan, of Pittsburgh, chairman executive committee; W. H. Harding, of Baltimore, secretary and treasurer; E. T. Lynch, of New York; Frank Ridlon, of Boston; T. Carpenter Smith, of Pittsburgh. Arthur Steuart, of the legal committee, and R. W. Ross, of Boston. In the course of the routine work the report of the secretary and treasurer was read and the financial condition of the association found to be satisfactory. Mr. Arthur Steuart reported on the work of the legal committee to whom the subject of revision of patent laws was referred. In the full discussion of the question which followed, the prevailing opinion of the committee seemed to be that patents as now issued are practically worthless until tested by the courts; it was argued that when a company adopts a patent and pays for it, it is only just that that patent should carry with it some security against infringement and some security against expensive litigations. It was decided that the association would insist upon the just revision of the patent laws.

The executive committee directed the secretary to correspond with the leading carbon companies of the country, requesting them to present their views at the Pittsburgh meeting of the association in February. The discussion in the matter of carbons covered quite a broad field, and incidentally took up the organization by the various electric light companies of the country, numbering about 300, of a co-operative carbon manufacturing company, which should furnish carbons to the local companies at the cost of production. This subject was moved heretofore, at a time when the manufacturers of carbons raised the price to an unreasonable figure. It having been reported that such action was again contemplated, the executive committee resolved this time to take time by the forelock. Mr. J. F. Morrison positively declined re-election to the office of the president of the National Electric Light Association; a sub-committee was appointed to take his declination under consideration and to recommend to the association at its coming meeting the name of a suitable person for that office. The general impression, or opinion, seemed to be in favor of the present chairman of the executive committee, Mr. S. A. Duncan, of Pittsburgh, who is also a member of the city council of that city. From the discussion and treatment of various subjects by the executive committee at this meeting, the coming meeting at Pittsburgh gives promise of being a very lively one. This is the seventh semi-annual meeting of this association, which has increased in three years from a membership of fifty to two hundred.

PAPERS TO BE READ AT THE CONVENTION.

A. L. Reinman, of Westinghouse Electric Co., on "Incandescent Lamps."

C. O. Mailloux, of Julien Electric Co., on "Storage Batteries."

F. J. Sprague, of the Sprague Motor Co., on "Dollar and Cent Question of the Motor Business."

P. O. Keilholtz, of U. S. Electric Ill. Co., Baltimore, Md., on "Fuel, Gas and Storage Batteries."

G. A. Leibig, of Baxter Motor Co., paper on Motors in general.

W. W. Leggett and Jesse M. Smith, paper upon the subject of "Underground Conduits for Arc Lights."

T. C. Smith, of Allegheny Co. Light Co., Pittsburgh, Pa., upon the practical side of the distribution of alternating current from central stations.

Prof. Thomson, of Thomson-Houston Co., on "Necessary Tests for Arc and Incandescent Mains."

O. B. Shellenberg, Electrician Westinghouse Electric Co., upon the life of incandescent lamps and the general principle governing the distribution from alternating currents.

Prof. Lange, Westinghouse Electric Co., upon the magnetic effect of currents upon various metals.

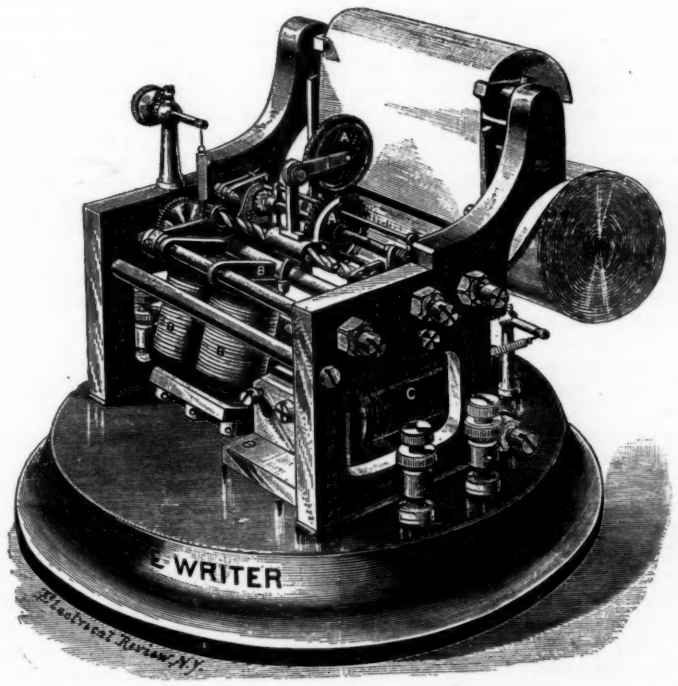
The Subway Commission of New York were invited to be present at the convention and express their views as to the feasibility, practicability and success of underground conduits from their observation in New York. Like commissions in Brooklyn and Philadelphia were also invited and if they could not attend, to be requested to send experts.

—— Chicago has an electrical expert in Alderman Clarke—at least he is experimenting with an incandescent lamp for street lighting purposes.

Electrical Type Setting.

A method of electrically operating and controlling a type-setting machine, or other printing instrument, or two or more such machines at different stations simultaneously, has just been patented by E. Fitzgerald Law, Pall Mall, England. According to the patentee, there is provided at each of the places where the matter is to be printed a suitable type-setting or other machine, which is constructed with levers or keys for releasing and arranging the different letters or other characters, or for operating the printing devices.

Each of these machines is comprised within an electric circuit, which also comprises a machine of a similar kind, situated at the place from which the news is to be sent.



A A A Type Wheel Axle and Ink Roller. B B B Type Propelling Pallett and Armature Magnet.
C Printing Magnet. D Screw for Returning Type to Zero.

The mechanism and connections are so arranged that when the type-setting machine at the transmitting office is being operated by the printer for the purpose of setting up type or for printing at the transmitting station, the same characters will be automatically set up or printed at each of the other offices comprised within the same circuit.

—— The Badger Electric Company, Milwaukee, which has been furnishing electric light for the past 18 months, is compelled to considerably extend its wires. The contract of the company to light the streets of Milwaukee began January 1st, 1888.

—— The "C. & C." Motor Company has just issued their catalogue for 1888. It is in a style somewhat different from the usual, and is well illustrated with various types of the C. & C. motors. Since bringing out their improved motors, this company has had a most rapid increase in business, and the factory at 90 South Fifth avenue is running at its full capacity. The new Wheeler regulator is an excellent feature of these motors.

An Electrical Type-Writer.

Mr. Higgins, of the London *Electrician*, writes that this apparatus, which fulfills the functions of a type-writer at any distance from the keyboard, consists of a type wheel, which contains the letters of the alphabet, numerals, and stops. The rotation of the type wheel is effected by means of intermittent currents transmitted from a commutator under the control of a pianoforte keyboard acting on propelment pallets carried by the lever suspended over an electro-magnet. The number of currents transmitted determines the position of the type wheel with respect to the swinging frame, which serves as a guide to the paper and at the same time as a platen to make the impression. This frame is pivoted at its end, and carries an armature which is acted upon by an electro-magnet.

The type wheel is automatically traversed horizontally after the printing of each letter, in order to take up a position for the succeeding character until the end of the line is reached, when the operator restores the type wheel to the starting position by pressing the appropriate key. At the time this takes place the paper is advanced sufficiently to space between the lines, and the operator may, by making successive contacts, rapidly advance the paper as much as may be required either to commence a fresh subject or to eject sufficient paper to bring the end of the message well into view.

The lateral spacing of the characters is uniform, and is determined by the printing operation. The platen frame, in falling back, rotates a screw, which carries the type wheel and ink roller. The spacing between the lines and the return of the type wheel to the starting point are effected at the same time by pressing a key which corresponds to a position on the commutator and the type wheel which is not occupied by a letter. A pin projecting from the type axis at this point causes the intervention of a block which acts as a fulcrum to a lever connected to and worked by the platen, but which only comes into operation to release the type wheel when thus provided with a fulcrum, and consequently only when the act of printing takes place with the type wheel in this position. A spring returns the type wheel to zero.

Synchronizing between the receiving and transmitting apparatus is secured by means of a lever, which is geared to a type axis by friction, and is carried by the revolution of the latter into the path of a projecting pin. Upon a print being made, this lever is reset at its starting point, but should three revolutions of the type wheel be made without a print, the wheel will be arrested at zero. By commencing a message always upon the zero or spacing key of the transmitter, the apparatus will be in unison.

Ink is supplied from an inking wheel in the usual manner.

—— The Great Falls Electric Light and Power Company, with headquarters in Washington, D. C., has been organized with a capital of $2,000. The Great Falls on the Potomac are to be used as the source of power. The directors are E. J. Elliss and Josiah M. Vale.

Insurance Electric Light Rules in England.

The Phœnix Fire Office has sent out the following rules for electric light installations and electrical power installations :

RULE No. 1. Where practicable, all conductors in a building should be so placed as to be easily accessible, and capable of being thoroughly inspected whenever required.

The running of conductors out of sight, such as between floors and ceilings, under roofs, behind wainscoting, etc., should be avoided as much as possible.

No. 2. All conductors to have sufficient sectional area, so as to allow at least one hundred per cent. more electricity being safely sent through them than will ever possibly be required for the lights they supply.

The sectional areas of the conductors must, in all cases, be such as to meet with the approval of the Inspector from the Fire Office. Under certain circumstances he may give special permission for a larger quantity of current to be sent through a given section of conductor than the proportion above named.

The conductors should be of copper, the conductivity of which should not be below 96%. The use of copper, however, is not obligatory.

All conductors of a larger sectional area than No. 14 S. W. G. should be composed of strands.

No. 3. No naked conductor, or conductors, allowed in a building.

No exception to this rule is allowed, except under those circumstances in which special permission to the contrary has been given by the Inspector from the Fire Office.

The frame work of arc lamps is not always included under the term "conductor" so far as this rule applies ; but the frame work of an electrolier or gas fitting is included.

No. 4. All conductors must be highly insulated with india rubber, or other equally good material or materials that will not too readily become plastic, that are impervious to moisture, and that are of lasting quality; and the insulation should be protected by strong and durable coverings, such as braided hemp, and the like. The insulation should be as uninflammable as practicable, regard of course being had that neither its efficacy nor its durability is in any way diminished thereby.

Conductors merely insulated with cotton, or cotton treated with paraffine wax (or analogous substances), will not be allowed, unless under very special circumstances, for which permission must be first obtained.

Bare conductors laid in wood will not be considered as coming under the head of insulated.

The resistance of the insulation of the conductors must be to the satisfaction of the Inspector from the Fire Office.

No. 5. In non-hazardous risks, the conductors having been thoroughly well insulated, as described under Rule No. 4, should, where practicable, be enclosed in substantial wood casing ; and the conductors kept apart by a continuous fillet of wood, and the fillet should be at least 2 inches wide in the case of the mains, and ¾ inch wide in that of the smallest branches. The casing should be composed of sound, hard, well-seasoned wood. Where casing is not used, the mains should be kept 6 inches, and the small branches 2 inches apart ; and no conductor should be less than 2 inches from any other conductor, or conducting substance, unless special precautions against contact have been taken. Where external injury is possible, the conductors must be enclosed in wood or slate casing, or separate metal or earthenware tubes, or laid in cement.

Where conductors are not enclosed, and when the electromotive force exceeds 200 volts with a direct current, or 100 volts with an alternating current, the distance they should be kept apart from each other, and from all other conducting substances, ought to be at least from six to twelve inches, unless permission for a lesser distance be given.

In hazardous risks, all conductors should be further protected. Having been thoroughly well insulated, as before described, they might be laid in wood casing, well painted with fireproof paint, and run in with cement, or asbestos, or other putty ; or they might be laid in cement, or in separate metal or earthenware tubes. The mains should not be less than four inches apart, nor the small branches less than one inch apart.

In hazardous risks, if the electromotive force exceeds 200 volts with a direct current or 100 volts with an alternating one, special precautions, varying according to the electromotive force employed and the surrounding conditions, may be required.

Where the current is of very high electromotive force, then the conductors must be encased and kept apart as described in Rule No. 20, for the primary conductors carrying alternating currents to secondary generators.

To be to the satisfaction of the Inspector from the Fire Office.

Where from nature of circumstances it is found impossible to follow out any part or parts of Rule No. 5, then the Inspector from the Fire Office will decide as to what shall be done in each particular case.

When lamps are in series, the minimum distance apart of any two conductors (or portions of the circuit) must be regulated by the difference of potential between such conductors (or portions of the circuit).

The small conductors about lamp fittings cannot always comply with Rule No. 5. The work, however, in connection with them, must be of a thoroughly secure character, and be done to the satisfaction of the Inspector from the Fire Office.

It is always preferable to use electroliers instead of utilizing existing gas fixtures, where it can be done.

Twin wires are allowed only in those cases that meet the approval of the Inspector from the Fire Office.

No. 6. All conductors in buildings passing between floors and ceilings, under roofs, behind wainscoting, through partitions, or otherwise out of sight, must, where practicable, be enclosed in wood or slate casing, or laid in cement, or in separate metal or earthenware tubes, in the manner described under Rule No. 5.

No conductor carrying an alternating current of over 100 volts to be laid out of sight unless permission be given.

In ordinary risks, wood casing may be employed, except under those circumstances when, in the opinion of the Inspector from the Fire Office, wood casing would not be desirable.

In passing through party wall separating two risks, provision must be made so that the conductors cannot be a means whereby fire can be communicated from one risk to the other.

No. 7. All conductors passing through the exterior walls of buildings must be insulated and enclosed in separate metal or earthenware tubes, or laid in cement, in the manner described under Rule No. 5.

The arrangement must be such as not only to prevent moisture entering, but also fire penetrating from the outside by running along the conductors.

No. 8. All conductors in a building that are exposed to moisture, must have a waterproof covering to their insulation. All wood casing, under similar conditions in or about a building, should be made waterproof.

No. 9. External conductors must, unless permission to the contrary be given, be insulated, and the insulation must be of a waterproof and durable character, calculated to resist deterioration from atmospheric influences.

The insulation, method of fixing, general arrangement, etc , to be to the satisfaction of the Inspector from the Fire Office.

Conductors passing over a building come under this rule.

No. 10. The fastenings of conductors should be composed of a non-conducting material. Where, however, metal staples are used, a piece of felt or india rubber should be inserted between the head of the staple and the insulation of the conductor. Staples, however, ought never to be used, saddles being preferable.

In the case of external conductors, the fastenings ought always to be composed of a non-conducting material.

No 11. When two conductors are joined together, the junction must be soldered. All joints must be very carefully made, and to the satisfaction of the Inspector from the Fire Office.

Rosin should be used when soldering.

No. 12. No ground circuit allowed.

No. 13. Wherever a branch is led off any conductor to supply current for one or more incandescent lamps, or for any other purpose, a short length of lead or other easily fusible wire, must be inserted between the main conductor and one end of the branch ; and the lead or other fusible wire must be of such section, length, and nature, that if the current passing through it exceeds the normal current by 50 per cent., then it will fuse and disconnect the branch.

By "branch" is meant any conductor issuing from another of greater sectional area.

If any conductor, by re-uniting with any other conductor, or by any other arrangement, becomes technically part of the main or otherwise, it will still be considered as a branch if its sectional area is less than the conductor it issues from, and must be protected as such, unless permission be given to the contrary.

The fusible wire should be placed as close to the root of the branch as practicable.

The mains themselves, both positive and negative, must be protected in a similar manner as near the dynamo as possible.

It is as well to protect both positive and negative branches by fusible cut-outs. In very hazardous risks this must be done, and it must also be done in non-hazardous risks, so far at least as the principal branches are concerned, when secondary generators, accumulators, or primary batteries are used.

With regard to arc circuits, or when incandescent lamps are arranged in series, the question as to whether fusible cut-outs, or what other kind of cut-outs should or should not be used, will be decided as each particular case arises ; so much depending upon the arrangement of the lights and the system of lighting ; means, however, must be taken for maintaining the constancy of the current, whatever number of lamps may be burning.

Should it be desired to use magnetic cut-outs, or any other kind of cut-out, in lieu of fusible ones, permission must first be obtained.

Under certain circumstances very fine copper wire may be used as a cut-out.

All cut-outs must meet the approval of the Inspector from the Fire Office ; many cases having occurred of cut-outs failing to act when required, and even, sometimes, themselves being the cause of a fire.

No. 14. All switches to be of such construction and make that they will not be liable after short use to get out of order and fire. Their construction should also be such, that it would be impossible for them to remain in any intermediate position between full on and off. To be approved by the Inspector from the Fire Office.

No. 15. All switches, resistances, and cut-outs, must be mounted and placed in such a secure manner that no danger can arise in the event of their heating, or fusing.

Switches, for instance, must always have an incombustible base. Resistance coils must be mounted on an incombustible material.

The switchboard should be composed of a fireproof material. Slate, under certain circumstances, is a very good material to use. The switch board should be in a dry place.

No. 16. All switches, bare connections, and lamps, must be so mounted, that leakage of electricity from them is rendered impossible.

No. 17. A double pole switch should be placed outside a building at or near the entrance of the conductors, when the electricity is generated externally. When the source of supply is internal, then a double pole switch should be placed in the dynamo room.

Where a switch cannot satisfactorily be placed outside a building, it must be fixed inside, as near the entrance of the conductors as possible.

Where practicable, every room and every passage should be controlled by a separate switch. Under certain circumstances double pole switches for this purpose might be used with advantage.

No. 18. No naked lights allowed. If arc lights are used, the globes must be enclosed at the base, and have chimneys so arranged that no sparks or flame can escape. The globes must be covered round with wire netting.

Unless permission to the contrary be given.

No. 19. No dynamo, motor, or any apparatus for generating electricity, to be placed in any working room of any cotton, woolen, flax, jute, or corn mill; or in any mill or factory of a like description; or in any working room or place where any hazardous process is carried on, or in which any hazardous goods are stored, or where there is special risk. Unless permission to the contrary be given.

By working room is meant, any room or place in which the raw material is undergoing any process tending to convert it into a more finished condition.

The steam-engine room, or the mechanics' shop, for this purpose would not be considered as a working room.

Secondary generators, accumulators, and primary batteries will come under this rule.

Any room or place in which accumulators or primary batteries are kept must have thoroughly good ventilation.

Wherever a dynamo (or other apparatus for generating electricity) be placed, especial care should be taken to see that the dynamo be thoroughly well insulated from earth. The same rule must be observed with regard to motors.

No. 20. Where secondary generators (or transformers) are employed, and the alternating primary current is of high electromotive force, it is preferable that neither the secondary generators nor any portion of the primary circuit in connection with them be placed inside any building, but in a fireproof structure apart. When, however, this cannot conveniently be done, the following precautions must be observed:

The primary conductors must be heavily insulated with india rubber of the highest quality, or other approved equally good material or materials, and must have a very strong external covering, and the insulation resistance must be very high, and to the satisfaction of the Inspector from the Fire Office. The conductors must be kept at a minimum distance of 12 inches from each other, and be enclosed in separate casing. The casing should be of a non-conducting material, waterproof and fireproof, and the arrangement must be such that no leakage of electricity can take place to earth from either of the conductors, or any short circuit from one to the other. The primary conductors must be furnished with a double-pole switch (or a separate switch on the lead and return), and also with double-pole cut-outs which act at 25 per cent. above the normal current. The switch (or switches) and cut-outs must be enclosed in fireproof boxes and placed in accessible and secure positions outside of the building, if practicable; if they cannot practically be placed outside, then they must be situated in thoroughly dry and secure positions close to the entry of the primary conductors into the building. Too much attention cannot be bestowed with regard to the placing of these portions of the primary work, nor the rendering of them safe and reliable.

The secondary generators (or transformers) must be encased in iron, or be in a fireproof compartment, and placed as close as possible to the entrance of the primary conductors into the building. They should be in a very secure and dry situation, and thoroughly insulated. The length of primary conductors inside any building should be extremely limited, and this notwithstanding that they be in fireproof casings.

The whole of the primary work (including conductors, secondary generators, switches and cut-outs) should be so placed and pro-

tected that it could not be tampered or interfered with by unauthorized persons.

All secondary conductors must be furnished with double-pole switches and protected by double-pole cut-outs to go at 50 per cent. above the normal.

To be approved by the Inspector from the Fire Office.

Where from the nature of circumstances it is found impossible to follow out any part or parts of these safeguards, then the Inspector from the Fire Office will decide as to what shall be done in each particular case as it arises.

The casings for the primary conductors must be fireproof, from their entrance into a building up to the "cut-outs." Should, however, it be desired to use non-fireproof casing from the "cut-outs" to the switch and secondary generators, special permission must first be obtained.

When secondary generators are arranged in series, the alteration of safeguards necessary will be decided as each particular case arises.

No. 21. When the "multiple parallel" system is intended to be used in any building, special permission must first be obtained. The insulation of the conductors should be of the highest possible character, similar to that described in Rule No. 20, for the primary conductors when secondary generators are used; and all work should be of the very best possible description, and on the surface where practicable.

Every parallel must have an efficient automatic "protector" of such make and design that, if the difference of potential of that parallel should rise to 25 per cent. above the normal from any cause whatsoever, then the protector will instantly bring back the potential to the normal, or else cut out the parallel. Means must also be adopted in the dynamo room for maintaining the constancy of the current, whatever number of lamps may be burning. A main switch must be placed in a fireproof box, in a secure and accessible position outside the buildings, when the electricity is generated externally; when the source is internal, then it must be situated in the dynamo room.

To be approved by the Inspector from the Fire Office.

By "dynamo room" is meant any place in which the electricity is generated.

No. 22. Where accumulators are employed the mains leading therefrom must have a double-pole switch (or a switch upon the lead and return) and double-pole cut-outs. The principal branches should also be protected in a similar manner.

The above rule will also apply when primary batteries are used.

No. 23. An electrical power installation requires the same safeguards that apply to an electric light installation, in which the conditions of supply and the electromotive force of the current are similar.

No 24. All work to be of a substantial character and put up in a thorough, workmanlike manner, and to be accurately tested at the time of erection for insulation and conductivity.

No. 25. In any electric light installation in which the current has an electromotive force of 200 volts or under, the insulation resistance over the whole circuit inside any buildings should never run below 10,000 ohms. The minimum insulation resistance for currents of higher electromotive force will be decided with regard to each particular case as it arises. It may be mentioned, however, that with currents of 1,000 volts the insulation resistance should never drop below 50,000 ohms, no matter how wet the weather may be.

Nothing is here stated as to what the insulation resistance should be when the installation is first put up, so many instances having occurred of the insulation breaking down after a short period. A statement of the insulation tests must be supplied if required. All tests should be regularly entered into a book kept for the purpose.

The best rule to follow, when laying the conductors, is to so arrange them that they would still be practically insulated, in the event of their insulating coverings getting worn away or removed.

No. 26. Whenever electricity is supplied from a "central station" to one or more buildings, accurate insulation tests should be made at least once daily over the whole system, including every building on the circuit or circuits, and a record be kept of the same. Too much attention cannot be bestowed on this matter, especially where secondary generators are employed or multiple parallel used.

No. 27. Before the electric light is used, notice should be sent to the fire office, in order that an opportunity may be given for the installation to be inspected with regard to its fire risk. Full particulars of the proposed installation and all its details should be supplied. The particulars must include a statement of the maximum current to be sent down the various conductors and the electromotive force of the current, also whether the current is to be direct or alternating. Samples of the conductors must be sent, that their conductivity and the quality of their insulation may be ascertained. Specimens of the cut-outs, protectors and switches may be required, should the description of them be obscure or unsatisfactory. It is preferable that these particulars be sent before the work of installation is commenced.

These rules are signed by Musgrave Heaphy, C. E., and are brought down to the year 1887.

* * A young lady watched the electric railway cars move off, with evident satisfaction, but at last turned to her father with nose in air: "Oh, papa," she exclaimed, "electricity will never do for street cars. Why, the smell is dreadful." The young lady was standing by an open gas trench.

The C. & C. Electric Motor and Silsby Electric Rotary Pump.

To the Editor of Electrical Review:

The combination of electric motors with piston or reciprocating pumps has been attempted by several manufacturers, with moderate results. It has been found that the best form of electric motor must, for obvious reasons, run at a high speed. And to communicate direct power to a reciprocating pump must, of necessity, complicate its parts and take greatly from the power of motor.

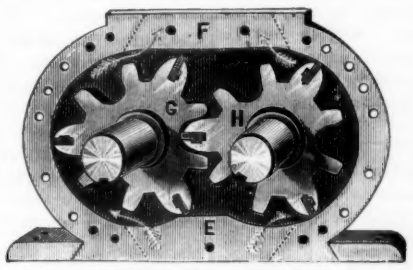


Fig. 2.—Body of Pump.

As the motor is strictly a "rotary," it would seem that the best form of pump would be one operating on the same principle as the motor.

In Fig. 1 we illustrate an ingenious outfit, showing combination of electric motor with the Silsby rotary pump, as applied for pumping water in city houses, stores and manufacturing establishments. All that is necessary is either the arc or incandescent circuit, from which the wires are run and connected with the motor. As electric light is now in general use all over the country, and especially in larger cities, there must be thousands of places where electric pumps can be utilized; and the small expense of running them, together with the low price of motor and pump, will at once recommend them. As compared with gas or hot air engines, which are now largely in use for city work, electric pumps have many advantages. Their first cost would be a great deal less; the cost of running would be a mere trifle, when compared with expense of running gas engines. As an illustration, an electric pump running from incandescent circuit (Edison), eight hours per day, and pumping at the rate of 500 gallons per hour, would cost, for electric current used, about $1.50 to $2 per month.

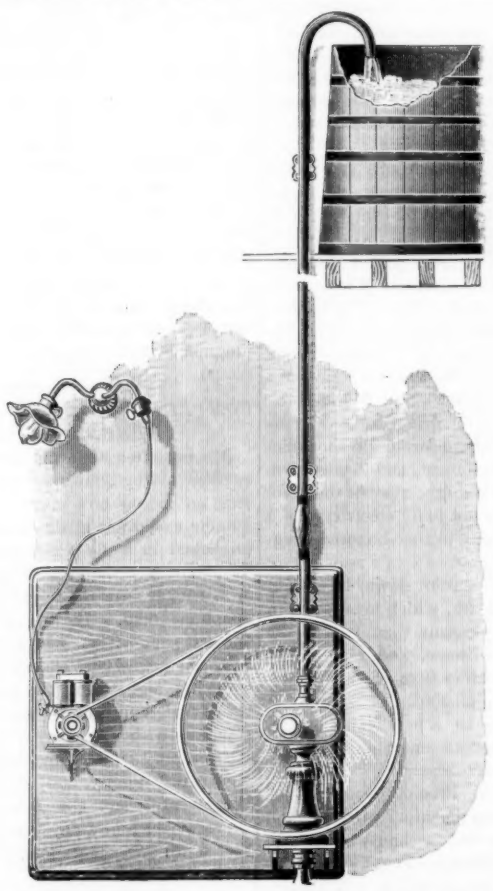


Fig. 1.—The "C. & C." No. 1 (1-8 H. P.) Motor and Pump Combination.

The United States Supply Company, 51 John street, New York city, have made many experiments with electric rotary pumps, and have constantly running, in their store window, an electric pump and motor, of the size especially adapted for pumping in private residences, etc., and to this company we would refer all parties who wish to learn more about electric pumps than we can describe in this article.

As to the rotary pump especially designed to be run by electricity, we need hardly say more than that it is made by The Silsby Manufacturing Co, of Seneca Falls, N. Y., which company no doubt stands at the head of all builders of rotary pumps in this country. Their famous Rotary Steam Fire Engines are well known to all our readers. But for those who wish to know more about the construction of pumps, we show in Fig. 2 the body of pump with outside case removed. The water enters at the bottom through the suction, *E*, the stream dividing and filling the chambers made by the long teeth, passing around the cams *G* and *H*, and discharging from the top through the outlet, *F*. The motion of the pump is equable, continuous, and rotary, the cams working together inwards from the top. When one chamber has just discharged, another is discharging, and another is on its way, and still another is just filling, so that the stream is always uniform and steady.

The vacuum made by this pump is perfect, insuring the immediate picking up of the water. There are no "dead points" to it, as in a piston pump when the plunger is at the end of the stroke, and the instant the pump is started, the air commences to exhaust in the suction pipe, and does not cease until the whole is exhausted and the water rises.

The water spaces are large, allowing free passage for any foreign matter that may enter the pump, and sandy, dirty, or gritty water can be worked with less injury than in any other pump.

These pumps are manufactured in several different sizes, to meet the requirements of the particular work for which they are to be adapted. They will, no doubt, be largely used in stores and large buildings, for fire protection, on account of their simplicity and reliability. In case of a fire it will only be necessary to turn a switch to set the pump in operation.

For elevator work they will meet with favor, and do away with high-priced steam pumps and hot air engines, at a great saving, both in first cost and expense of running. The switch for starting and stopping the motor and pump may be placed in an upper story of the building, or elsewhere, as desired. The speed of the apparatus, and consequently the quantity of liquid to be pumped, can be regulated at will, by moving the switch a greater or less distance on the switchboard. The advantages of this combination, for a great variety of pumping purposes, will at once be apparent.

Chas. A. Allen.

New York, Dec. 21, 1887.

—— The basement of the Bennett Building in Nassau street is used for supplying electricity to the *Herald* establishment, which uses more than 500 burners.

—— The Long Island Electric Company, which operates the new electric railroad running from Jamaica to Brooklyn, has elected Col. Aaron A. Degrauw President of the Board of Trustees.

—— The Schuyler Electric Light Co., of Knoxville, Tenn., has bought an additional arc dynamo and will soon break ground for a new incandescent plant. For two years this company has given the Knoxville people very satisfactory lights which are now being appreciated by an increased demand. The good service of the Schuyler has convinced the citizens that there is money in it, and they are now taking hold with the same enterprise that they have shown in regard to increasing their business in the way of introducing new capital to come to their handsome city.

ELECTRICAL REVIEW

Published at 13 Park Row,
P. O. BOX 3329.

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REGISTERED CABLE ADDRESS:
"Electview," New York.

SUBSCRIPTION.
United States and Canada, $3.00 per annum, in advance. Postage paid by publisher.
Great Britain and other foreign countries, $4.00, in advance. Postage paid by publisher.

ADVERTISING.
Transient, 25 cents per line, nonpareil.

DEALERS SUPPLIED BY
The Albany News Company, Albany, N. Y.
The American News Company, New York, N. Y.
The Baltimore News Company, Baltimore, Md.
The Brooklyn News Company, Brooklyn, N. Y.
The Central News Company, Philadelphia, Pa.
The Cincinnati News Company, Cincinnati, Ohio.
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The Union News Company, New York, N. Y.
The Washington News Company, Washington, D. C.
The Western News Company, Chicago, Ill.
The Williamsburgh News Co., Brooklyn, E. D., N. Y.

EDITORIAL ANNOUNCEMENT.

Address all communications and make all Express Money orders, P. O. orders and checks, payable to order of ELECTRICAL REVIEW, P. O. Box 3329, New York.

We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address

Mr. C. C. Haskins, 118 LaSalle Street, Chicago, Ill., will represent the REVIEW in the West.
Messrs Wm Dawson & Sons, 121 Cannon Street, London, England, are our representatives for Great Britain.

NEW YORK, JANUARY 14, 1888.

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The *Firemen's Herald*, in a recent issue, speaks of the REVIEW as the "undoubted authority on all electrical subjects." The same to you, esteemed contemporary, in your field of fire fighting.

The formal opening of the new club house of the Electric Club is announced for January 31st. Prof. H. A. Rowland, of Johns Hopkins University, will deliver the address of the evening.

New York city possesses an earnest student of electro-metallurgy in one of her blue coated guardians. Officer W. H. Breakell, who has served twenty-two years on the force and, if we mistake not, is entitled to retirement, is the worker in this interesting field.

Mr. S. A. Duncan, of Pittsburgh, will be recommended by the executive committee of the National Electric Light Association, for the position of president of the association at the Pittsburgh convention. Mr. Duncan has always been an active member of the association, and is putting forth every effort to make the Pittsburgh meeting an interesting and instructive occasion, which we have no doubt it will be.

Electricity is soon to be put to a novel use in Massachusetts. A number of wealthy Newton gentlemen are about to apply electricity to lighting their sleighs this winter and at other times to their closed and open carriages. Batteries are to be used which will furnish three lights of six-candle power and will burn for thirty hours. After the electricity is all used up the batteries are taken to some dynamo and recharged. The expense for this charging, it is thought, will not be over 50 cents each time. An electric light sleighing carnival on the Mile Ground is not beyond the probabilities this winter.

The idea of adopting electricity as a means of inflicting capital punishment does not meet with the approbation of everyone. As a class, the criminals—those who deserve such punishment—no doubt prefer the electric method, painless, sure, and, if so desired, unexpected in its application. We confess to a dislike of this lugubrious use of the electric current. Still, it now seems probable that its adoption by the State of New York to supplant the hangman's rope will soon be decided upon. The *Christian Advocate* seems to think consistency desirable in the infliction of capital punishment, and that innovation in the method might unsettle the practice itself. It does not favor electricity as a means in preference to time-honored hanging, and says:

"To refine the matter down to a point which will make death, which must come to all, vastly more pleasant than it is in the course of human disease, and scientifically more fascinating, rather than essentially degrading, may rob punishment of so much of its terror as to make it practically useless, in many cases, as a deterrent warning."

Prof. Richard A. Proctor comes to the rescue of the flying machine inventors, and calls attention to a fact that must be a fascinating one to all railroad stockholders, when he says a "great advantage will be that, though aerial mechanisms will have to be renewed at probably somewhat frequent intervals, the aerial roadway will never need repairing." There would certainly be very slight danger of collision among ships of the air, carrying, of course, electric headlights, and guided and controlled by electricity.

Prof. Proctor, in concluding, says: "That the man who has learned to traverse the land more swiftly by mechanical means than its most active denizens, and to make the wide seas his highway by similar devices, should be unable to travel in the air, which by natural selection alone has become the home of creatures descended from reptilian forms, is to me unthinkable. Whenever the power of flight, as distinguished from mere floatation, has been obtained, the swiftest methods of travel ever employed by men will be devised. For one of the conditions of safe and speedy flight is a very high velocity. Swift motion must be secured at the beginning of each journey and maintained throughout."

THE SUPREME COURT'S DECISION.

The decision of the Supreme Court, long looked for and anxiously awaited, has so far failed to appear. Those whose interest it is to want a decision adverse to the Bell patents are building high hopes upon this delay, or, to put it more exactly, are seeking to dispose of their stock in infringing companies by inculcating the idea that delay portends disaster to the Bell company. If they really thought so, one would suppose the logical thing for them to do would be to hold on to their investment in the bogus companies and sell after the rise. Let us look at the facts. The Supreme Court has not one, but six cases under consideration. The evidence which they have to examine is contained in some forty portly volumes, each about the size of Webster's Unabridged, and just about as interesting for a steady diet. While the controlling questions are not numerous, there are a great number of minor but important questions which must be carefully considered. To the majority of the judges the whole subject is new. The importance of the decision is known to all, and the responsibility which rests upon the court is very great. Meantime hundreds of other cases are before them, and the routine work of the court must not be neglected. Taking these facts into consideration, and the further fact that the judicial mind is proverbially slow in reaching a conclusion, it will be seen that the delay means only that the court is slowly and carefully sifting and weighing the evidence, and has not yet reached a conclusion. A decision reached after such careful and methodical examination of the subject will have ten times the value of a judgment based upon one or two salient points.

In Kansas, one Mrs. Murin had a little unpleasantness with the St. Joseph Electric Light Company, caused by her stepping on a wire which had somehow got loose and fallen in the street. This was in 1885. Mrs. M., who was a washerwoman, sued for damages and was awarded $4,999. The odd cent was lost in the shuffle. A motion was made for a new trial, but Judge Krekel gave the washerlady, whose front name is Alice, the benefit of a favorable ruling, and denied the writ. The Judge stated in his decision that it was one of the most worthy cases for sustaining judgment which ever came under his consideration.

COMPLIMENTING THE OMAHA TELEPHONE SERVICE.

It is not often that the daily press is discovered giving praise to the telephone service, no matter how much it is merited. A notable exception is the Omaha *Republican*, published in a city where those well-known telephone men, Messrs. Flemon Drake and J. J. Dickey, are the reigning powers in the telephone field. If we mistake not, the Omaha paper from which we quote below has been a consistent enemy of the telephone company, and during the period of moving the exchange into new offices, belabored the company without mercy, and generally without reason. In the Omaha exchange, every wire is tested daily, and in this way trouble is prevented, and complaints now do not average over four a day, where formerly they footed up thirty and more. The *Republican* says:

The Chicago *Herald* is making a three-column-a-day-illustrated war on the telephone system of that city, and piles up complaints enough, if it can sustain them, to establish the fact that, instead of a public convenience, it is a public nuisance, which the authorities should abate.

And this complaint of the *Herald* gives the *Republican* opportunity to say that, so far at least as concerns the night service of the telephone exchange in this city, it is of the very best. The day service is doubtless equally good, but morning newspapers have use for the telephone almost exclusively at night, and so know best what it is at that time. The *Republican* uses the telephone from fifty to a hundred times each night. It is chronically in a hurry, and very rarely indeed has its patience tried. The operators are both prompt and accommodating, and frequently place the reporters under obligations in one way or another. The service might, in fact, be a good deal worse, and not leave room for complaint; it couldn't well be much better, and the *Republican* takes pleasure in this public recognition of the fact."

OUR CHICAGO LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

Prof. Barrett's report to the city council, in response to the mandate of that body asking information on cost of electric lighting for the city—both public and private—was submitted to the council on Tuesday, the 3d instant.

In his report he classified electric lighting under three heads:

1. Central Station (incandescent) system.
2. Municipal " "
3. Arc lighting " "

Estimates based on 75,000 16 c.p. lamps in use, with an equipment of 175,000 lamps, and a daily average of 840,000 lamp hours.

COST.

Underground complete, including restored street	$1,000,000
Boilers and steam appliances complete	400,000
Electrical machinery, etc	550,000
	$1,950,000

To this must be added real estate, unless the city now owns property which could be made available. The Professor suggested that perhaps the Water Works property could be used.

DAILY MAINTENANCE.

Coal	$525
Renewals, 1,002 lamps	852
Water	35
Oil and waste	25
Ashes (removal)	55
Meter Department (accounting)	50
Other official expenses	40
Firemen	40
Engineers	50
Dynamo and regulator men	18
Depreciation—underground	50
" electrical	40
" steam	70
Incidentals	20
Total	$1,870

$1,870 is about the equivalent of gas at 50 cents per 1,000 feet.

MUNICIPAL SYSTEM.

Pressure between that of the above and less than that of the arc systems. Lamps mostly 30 candle power, but with any required variations in that particular.

COST OF PLANT.

Electrical plant	$19,800
Steam "	26,400
Conductors for underground, complete	16,500
Gas post extensions	19,800
Superintending construction, etc	8,500
Conduits, including trenching, repaving, &c.	442,698
	$533,698
Add building for station, say	8,000
Total	$541,698

DAILY MAINTENANCE

Coal	$50
Oil &c	3
Engineer and electrician	10
Assistants and firemen	15
Linemen	5
Repairs	4
Renewals	40
	$127

ARC LIGHTING—PLANT.

Dynamos and 750 double lamps	$55,350
3,300 h.p. engines—plant complete	30,000
750 posts, 16 feet erected	11,250
75 miles underground in pipes, complete	112,000
Do. trenching, laying and replacing pavements	218,630
Station, rebuilding present building	8,000
	$435,230

YEARLY MAINTENANCE.

Coal, 4,000 tons, $3	$12,000
Carbons	2,500
Oil, etc	3,500
Electrician and engineer	1,500
3 assistants	3,000
4 firemen	2,400
Trimmers and linemen	6,000
Repairs	4,000
	$35,900

Assuming that there are 3,273 public and private street lamps within the territory named—from 12th street and Chicago avenue, and between Halsted and the lake—and that each of these sheds 16 candle power, there will be

Total candle power	52,368
With the incandescent system above 3,273 lamps at 30 candle power would give total candle power	98,190
In favor of the latter	45,822

or nearly twice the light.

Again, 750 arc lamps would shed at 2,000 c.p. a total of 1,500,000 candles. Allowing for any possible excess of illumination claimed, there would still be a large balance in favor of electric lighting. While the arc is undoubtedly preferable for bridges, viaducts, or any large spaces where an intense light is required in a concentrated form, a less amount, more evenly distributed, is preferable along the thoroughfares.

COMPARATIVE COST OF GAS AND ELECTRIC LIGHTING.

	No. of lights.	C.P.	Cost per annum.
Gas	3,273	52,368	$61,756 26
Incandescent	3,273	98,190	46,780 00
Arc	750	1,500,000	35,900 00

I have endeavored in the above condensed form to give the gist of the Professor's able and exhaustive paper, which has opened the eyes of the council and the people as well. Just now, when our gas, as near as the olfactory nerves can judge, is largely made up of about equal quantities of extract of *mephitis putoris*, bad eggs and back-date onions, and burns with a sickly, lack-luster, blue flame, the people are becoming very much interested in the light question, and the journals, having worn out the telephone gag, are now pouncing upon the gas people. We must have something in the way of sensation. Pretty soon, now, Lent will be upon us, but up to Ash Wednesday a sensation is as necessary to keep the papers alive as food to a hungry man; and it would be as nearly impossible for them to be a success without it as to run a modern drama without a revolver and a deceived "young person."

Mr. A. H. Brown, electrician of the Arc Light and Power Company, has resigned that position, and will hereafter be connected with Messrs. Leonard & Izard.

Chicago, Jan. 7, 1888. C. C. H.

OUR BOSTON LETTER.

A number of wealthy citizens of Newton are about to apply electricity to lighting their sleighs this winter, and at other times to their open or closed carriages. A Boston gentleman has recently gone to New York to secure the right to use electric accumulators on public carriages and conveyances of all sorts. Mr. J. T. Moriarty, of the New York Accumulator Company, is about to fit out the sleighs of the Newton gentlemen with the electric light.

At a meeting of the Electric Club on Monday last the newly elected officers assumed their positions. The retiring president, Mr. Ridlon, introduced President Alexander, who made a short address, calling upon all members to do their duty to the club and its officers, and make the year, if possible, more prosperous than ever. Mr. Cram made a report for the executive committee, and several minor reports were made. The nine candidates for admission mentioned last week were elected to membership in the club.

The first annual dinner of the Thomson-Houston Company's foremen and assistants was given at the Boscobel in Lynn, on Tuesday evening last. The fact that there were 56 names on the list gives some idea of the business of this company's Lynn factory. The *menu* card was well gotten up, and beside containing the list of tempting edibles it presented some bright hits which were thoroughly appreciated by those present. Mr. A. L. Rohrer presided and acted as toastmaster, and much credit belongs to him for the success of the occasion. Three rousing cheers for the Thomson-Houston Company closed the evening festivities.

Mr. William J. Hopkins, formerly assistant electrical inspector for the Boston Manufacturers' Mutual Fire Insurance Company, has been appointed on the electrical staff of the American Bell Telephone Company. After his graduation from the Institute of Technology, Mr. Hopkins was a draftsman for the Insurance Company, leaving their employment for that of the Western Electric Company at Boston, and at a later day returning to the service of the insurance company in the position which he now leaves. He is considered well qualified by his education and practical experience for his new position.

Edward Blake, of the Sprague Company, was in Richmond Friday and Saturday, when the new Sprague Electric Street Railway was put in operation for the first time. He telegraphs back that the trials were eminently satisfactory.

Fuller, Holzer & Co. have recently finished a very artistic work in the wiring and putting in of the Edison incandescent lamps in "Déjéuner," the new café on Tremont street.

The Slater Manufacturing Company, of Webster, Mass., has introduced an incandescent light plant of 500 lights. They are among the first to adopt the isolated method of lighting.

The *Technology Quarterly*, No, 2, which appeared Saturday, contains an article by Edward E. Higgins, S B., on the "Efficiency of the Brush Storage Battery."

T. W. S.

Boston, January 9, 1888.

The Annual Report of the New York Board of Electrical Control.

The present Board of Electrical Control succeeded the Board of Electrical Subway Commissioners by the Subway Act of the last Legislature, and the report, which was adopted last week, opens with a review of the work accomplished under the old organization. This work included the laying of two miles of conduit in Sixth avenue, capable of containing 2,500 miles of wire.

After referring to the appeal made to the Legislature last winter for an interpretation of the acts constituting the old board, the present situation under the act of 1887 is summed up as follows:

A commission of four members, one of them being the Mayor of the city, ex-officio, is constituted, with full authority over all the electrical conductors in the city of New York, and with the special ministerial duty of changing the present overhead systems to underground systems, by the providing of subways suitable for occupancy by the companies doing business at present with overhead conductors. A construction company (the Consolidated Telegraph and Electrical Subway Company) is authorized to construct the subways designed by the commission, and to permit the use of them by electrical companies upon fair and impartial terms. Over the excavations of this construction company in the streets, the local authorities, represented by the Commissioner of Public Works, have full control. Its profits are limited to ten per cent. on the money actually invested by it in carrying out the directions of the commssion—the excess going to the city; and to all its books and accounts the local authorities, represented by the Controller, have access.

A provision of law makes it incumbent upon the board to give companies operating conductors overhead ninety days of notice after a sufficient construction of subways has been made ready in any street or locality—reference being had to the general direction of the wires in use; and in the event of the companies so notified not removing their poles and wires from the street before the expiration of the ninety days of notice, it is provided that the local authorities shall thereupon remove them. This state of affairs would seem to be admirably adapted for the fulfillment of the task imposed upon the board.

The board organized on July 5th, and it has pushed the work energetically with the following results:

The total length of trench excavated for the laying of subways since July, 1887, is one hundred and eighty-nine thousand, nine hundred and eighteen (189,918) feet.

The total construction of single duct for telephone and telegraph service is 903,180 feet, to which must be added 4,050 feet for distributing service and connections to central stations.

Estimating eighty wires per single duct, the total capacity for telegraph and telephone service is 72,254,400 feet, or about 13,700 miles of wire.

The total construction of single duct conduit for arc lighting and power service is 254,250 feet, and the capacity of this conduit may be estimated as sufficient for 2,542,500 feet of wire, or nearly 500 miles.

In addition to the above, the number of feet of conduit for incandescent lighting is 186,745, containing 560,235 feet of conductors.

On all the streets and avenues the companies whose wires have been provided for have been directed to remove their poles and wires from the surface within ninety days, and at the expiration of that time, in case they are not so removed, it becomes possible for the local authorities to remove them forthwith.

The capacity of conduit provided in the City of New York during the existence of the Board of Electrical Control is therefore considerably greater than there is in any city in the world, so far as the information of the board extends; and notwithstanding the great difficulties which surrounded this whole subject in this city, which has a greater mileage of wire than any other, and where the circumstances of underground construction are as difficult as in any other, the conversion of the present overhead to an underground system is a fact about to be accomplished, to a very great extent at least, in the near future.

Already the Western Union Telegraph Company has some 500 miles of wire underground between Exchange place and the Brooklyn Bridge.

The Metropolitan Telephone and Telegraph Company has some 500 miles of wire in the Sixth avenue conduit, besides hundreds of miles more in other parts of the city; and the Edison Illuminating Company, whose conductors were laid in the trench at the time of the construction, has more than 100 miles of conductors underground.

The Metropolitan Telephone and Telegraph Company, the Western Union Telegraph Company, the Brush Electric Light Company, and others, are preparing to enter the subways at many points, and should the efforts of the Board be seconded by energetic action on the part of the local authorities when the ninety days of notice has expired, many of the streets must necessarily be freed from the pole systems.

The actual number of poles and wires removed from the surface of the streets as a result of the work of the board, is announced as follows:

On east side of Third av., between 46th and 110th sts.	127 poles.
On east side of Ninth av., between 17th and 50th sts.	75 poles.
On 55th st., between Second av. and East River.	15 poles.
Total	217 poles.
On east side Third av., from 46th to 110th st.	17 wires.
On avenue A and First av., from 5th to 55th st.	12 wires.
On 55th st., from Tenth av. to North River.	47 wires.
On Eleventh av., from 15th to 55th st.	16 wires.
On Sixth av., from 20th to 58th st.	155 wires.
Making a total of	247 wires.

In addition to the above, the local authorities have been requested to remove the following wires, poles and fixtures, the ninety days of notice having expired:

All the wires of the Metropolitan Telephone and Telegraph Company on Sixth avenue from Twenty-second to Thirty-second st., in number from 15 to 38.

All the poles of the Metropolitan Telephone and Telegraph Company, or lately used by them, on Sixth avenue, from Twentieth to Thirty-second st., in number 20; except such as may be required by the Fire and Police Departments.

All the poles and wires of the United States Illuminating Company on Twenty-fifth st, from Broadway to Sixth av. 4 wires and 5 poles; the poles on the corners of Broadway and Sixth av. excepted.

A very much greater number of poles could have been removed had the wires of the Fire and Police Departments been provided for by the local authorities; these wires being practically outside of the control of the board. as well as the poles which are necessary to their support.

The board is, however, informed that active measures are being taken to provide underground conductors for these services.

The duties of the board extend to the making of rules and regulations for the maintenance of the wires overhead where this is necessary, either before the subways are completed or in connection with the subways after they are built.

Very little progress has been made by the board in this direction.

The telegraph and telephone services are, except in the cases of fires, in very little danger, and, in the main, wires devoted to this sort of business are in good condition.

In many places in the city of New York. electric light and power wires are carried dangerously near buildings, awnings, telegraph and other poles, lamp posts and other street obstructions.

Again, in many parts of the city, several distinct lines of poles, carrying electric light conductors, are to be found on the same side of the street, and as these poles necessarily differ in height, the wires upon them form a complete network, rendering the efficient use of the hooks and ladders and life-saving apparatus of the fire department almost impossible; whereas, the placing of all the wires on the same side of any street upon one line of poles would, in a great measure, obviate this difficulty.

Again, a nuisance has been created by the fact that companies having contracts to light the city by electric light are allowed to own the lamp posts they use, which necessitates frequent tearing up of the pavements when any new contracts are awarded.

The board has endeavored to find a remedy for some of these dangers and difficulties in rules and regulations which it has established for the government of overhead wires.

A thorough inspection, classification and reconstruction (so far as it is to be continued after completion of the subways) of the overhead service is a duty to which the board will turn its attention as soon as possible, and it is believed that, with the rules and regulations already adopted, amended and added to as shall seem proper from time to time, the complications of the overhead wires will be materially diminished.

In inaugurating the underground system, the commission has followed certain principles which may be defined as follows:

First. A conduit or subway for electric conductors is nothing more than a mechanical protection for the wires within it, and a convenience for placing and protecting them underground.

Second. Electric light and power conductors should, as a matter of precaution, if not of necessity, be operated separately, and as far as possible from those for the transmission of currents of lesser intensity.

Third. The material and form of the subway should depend largely upon the requirements of the locality and the service for which it is designed.

Fourth. Drawing-in-and-out conduits, with convenient manholes, are in the main the most desirable for the streets of this city, where a condition of the law allowing the companies ninety days to place their conductors in the subways after they are constructed, necessitates that the subways shall be easily accessible without serious disturbance of the pavement.

Fifth. The success of the underground service depends largely upon the proper insulation of the wires, and the largest liberty compatible with the preservation of the rights of others should be allowed to the companies making use of the subways.

Sixth. The nature of local connections depends to a great extent upon the service and locality for which they are designed, and here again liberty of choice under proper restrictions may reasonably be allowed.

The subways, with the exception of the construction for the Edison incandescent plant, are all on the drawing-in and-out pattern, which means a tube or a series of tubes or ducts through which cables or insulated wires can be drawn, terminating at distances of about 200 feet in boxes or manholes, to which access can be had from the street by removing an iron cover.

The liberality which the commission has seen fit to exercise in the matter of additions to the conduits for the purpose of making local connections, allowing the Construction Company to furnish whatever the several companies desire for themselves from the manholes to the points desired to be reached, has been taken advantage of and promises beneficial results.

For example, the Construction Company has at least in one instance employed the hand-hole system of distribution for the use of the telephone wires in down-town streets where it seemed desirable, while at other points a single entrance into a block in connection with housetop distribution has proved efficient.

The way in which the resolution notifying companies to place their wires in the subways was drawn, practically allows the companies operating wires to select their own methods of getting from the manholes to their subscribers, while at the same time the authority of the commission over the Construction Company and its work, as well as the supervision of the Construction Company itself over the underground accommodations, is preserved.

In conclusion the report dwells on the way in which the efficacy of the Board has been impaired through lack of funds and doubt as to payment of its expenditures. "The collection from the electrical companies," it adds, "of the moneys appropriated for the Board of Commissioners of Electrical Subways and the Board of Electrical Control, has proceeded so slowly that up to the present time arrears of pay are due to the officers and employes of the board from January, 1887, while other accounts are outstanding for debts contracted even prior to that date. A liberal appropriation, which shall enable the employment of competent inspectors to classify the overhead wires with a view of their being placed in proper condition, and to supervise the subways and the wires within them, and which will also enable the fulfillment of obligations to the officers, employes and creditors of the board, is therefore suggested."

The Central Union Telephone Company has issued notice of a $1.25 dividend per share. The Great Southern has come to the front with a dividend of $2 per share, which is a glad surprise to holders of shares.

Mr. C. J. Kintner, the well known patent expert and attorney, of 265 Broadway, has associated with him Mr. Carl Hering, M. E., of Philadelphia. Mr. Hering will take an active part in all expert business and in the experimental work and laboratory tests.

Monday evening, January, 16, at 8:15 o'clock, a lecture on "The Telephone" will be delivered by Mr. Chas. Dutton, Auditor of the Southern Bell Telephone Company, before the Institute of Accounts, in the chapel of the University, Washington square. The subject will be illustrated and will be interestingly presented by Mr. Dutton. The members of the Electric Club, of which Mr. Dutton is a member, have been invited to be present.

Telephonic News

*** An effort is being made to provide Broadway, Long Branch, with an electric railway.

*** Mr. C. N. Fay, of Chicago, and the editor of the *Tribune*, of that city, are enjoying a spicy exchange of views over the vexed question of salaries of telephone girls.

*** Henry B Oakman, formerly with the Electrical Supply Company, is now connected with the American Telephone and Telegraph Company (long distance) as special agent.

*** As we now have Philadelphia, Boston and Albany in speaking distance with New York, Buffalo is of the opinion that her turn to be connected with the metropolis should come next.

*** "Hello" writes to a Rochester paper, claiming that the local telephone committee has been unfaithful to the people. There is an evident desire in that city to return to the advantages of the telephone.

*** The Erie Telephone Company added 72 new subscribers to its system during November, and had connected, December 1, 1887, 10,433, against 9,411, December 1, 1886—a gain of 1,022 in 12 months.

*** The hard-drawn copper wire in use by the telephone company between Utica and Syracuse is giving great satisfaction to patrons. Hard-drawn copper and the long-distance transmitter get the conversation through without much difficulty.

*** The managers of the Toronto, Can., telephone exchange, claims that, "There are more telephones in Toronto than in any other city of its size," and states that it has about as many as Montreal, and more than Buffalo, and that the use per day is nearly three times that of Buffalo. The number of employes is 100, about 30 of that number being ladies.

*** The scientific activity of the age is shown in the fact that the twelve principal chemical societies of the world have an aggregate membership of over eight thousand, nearly all of these members being active contributors to the advancement of chemical science, and publishing their results mostly in periodicals especially devoted to such subjects. Excluding transactions of societies and journals of physics and pharmacy, these chemical periodicals issue annually about twenty thousand pages.

*** The use of the telephone has become so general, that the public is inclined to overlook the fact of its comparatively recent invention and the sensation it then created in the scientific world. Among the more important business factors of Oswego, N. Y., the admirable telephone service is certainly worthy of mention. The Oswego Telephone Exchange is operated by the Empire State Telephone and Telegraph Company of Auburn, and is one of the largest and most important in the territory of that company, which comprises the counties of Oswego, Cayuga, Cortland, Seneca, Wayne, Ontario and Yates. It has 175 subscribers, and is connected by seven trunk lines with the territory of the Central New York Telephone and Telegraph Company on the east, the New York and Pennsylvania Telephone and Telegraph Company on the south, and the Bell Telephone company of Buffalo on the west, as well as the whole of the Empire State Telephone and Telegraph Company's territory. The exchange is managed by Mr. Martin Joyce, who is also Superintendent of the Oswego district. The company has put in fifteen new telephones the past year. They cost $50 a year for business houses and $45 for dwellings.

Some of the Difficulties that Beset the Telephone Man's Peace of Mind.

In a recent interview, Charles F. Cutler president of the New York and New Jersey Telephone Company, and a director or officer in nearly all the companies in or near New York city, was asked to mention a few telephone problems as looked at from the point of view of the companies.

'Well," said he, smilingly, "there are enough of them. There are complaints about exchanges, in this city and Brooklyn, for instance. When the Assembly Investigating Committee was here, one witness complained that when he called up Brooklyn he was greatly annoyed by the talking of the girls at the central office. It turns out that he had no teeth, and the trouble lay in his voice. Then, too, he was not a subscriber, and had used another man's telephone. In order to use a telephone properly, practice is necessary, and the user must have a good voice. A man who uses a telephone only once a week is apt to find fault. A great deal of fun was made of us over Assemblyman Saxton's attempt to talk with Brooklyn when the committee was sitting. He was inexperienced at the 'phone, and he called for the Brooklyn number 767, which is a most difficult combination for a man who does not know how to put the instrument to his ear. A newspaper of this city complained about its Jersey City telephone. We sent a man to investigate. He asked the Jersey City man to try the 'phone. He began calling 'Hello, hello,' with his head turned toward our man, instead of toward the transmitter, and naturally enough he exclaimed, 'You see it's no use!' Our man tried it, and he found everything all right, even when talking in a low tone of voice. This is a sample of our experience.

"The service is by no means perfect," continued Mr. Cutler, "but in this city it is fifty per cent. ahead of that in any other city of over 3,000 inhabitants. See the diplomacy of the witness, who, when asked to compare the service here and in London, said that, from what he had heard of it here, and had seen of it in London, the London service was better. The contrary is true, as I know from personal investigation. London, in fact, has the poorest service in the world. The change to underground service here, in the last year, has been a disturbing cause. The underground service is slower and harder to hear, but the subscriber must get used to it, and with some practice he will have no trouble.

"One source of complaint lies in a man's impatience to get a response at once. He does not stop to think that often three connections have to be made before he can get his man. If the line he wants turns out to be in use he will growl because he was not told so at the start, when the operator could not find it out until the connections had been made. One man complained that he could not get his line when he wanted it, and he said that he was not using it himself to any extent. We investigated, and found that he used his line, on an average, four and a half hours a day, sixty times a day, or 18,000 times a year, costing him only half a cent a message, as he paid $90 a year in Brooklyn. Besides, he was a plumber, and the line was used in receiving orders! He was the last man who ought to kick. We have tried to get him to come before the investigating committee. Perhaps he has found out what we know about it."

*** Judge Vinton, sitting in the Circuit Court, Lafayette, Ind., has decided that telephone companies doing a general telephone business are compelled by the State statute to furnish instruments at the legal rate of $3 a month, whether they wish to do so or not. The case came up on an application of the Folley Hardware Company for a writ of mandate requiring the Central Union Telephone Company to place an instrument in its building at $3 a month. The court held good the demurrers to the company's answers, and decided that under the statutes the company was bound to furnish every applicant with a complete outfit of instruments and connections. The company endeavored to show that it was not furnishing private wires or private telephones, but that it established public stations throughout the city, at which each person, upon the payment of five cents, could be placed in communication with all portions of the system. The court held that the company was engaged in a general telephone business, and was bound to furnish all persons applying for service with telephones and telephonic connections and facilities at their place of business or storeroom for the sum of $3 a month. The company will appeal.

The Nebraska Telephone Company.

Among the various Omaha enterprises which have made heavy expenditures the present year, in an endeavor to keep pace with the rapid growth of the city and the multiplied demands of the public, as well as to increase its own usefulness and business prosperity, says the *Republican* of that city, none surpass the Nebraska telephone exchange, which has during the past year completely revolutionized its entire system in the city, giving its subscribers practically a new service.

The old service was wholly inadequate to the demands of the city and unsatisfactory alike to the company and its patrons. At the beginning of the year the numerous old and unsightly wires were taken down and cables put up, each containing numerous small wires. During the year just closed 211 miles of these cables and wires were put up in this city, and the company now has in operation over 700 miles Nine connecting lines have been built during the year, and seven new offices and exchanges added. Local lines have been built through Iowa during the year, so that there is a continuous line from Omaha to the Mississippi river. Of course these lines are not capable of carrying the voice, on account of the numerous offices through which they pass.

From the first of January to the first of July the business of the company was practically at a standstill. Since the latter date, however, there have been added to the exchange over 200 subscribers, and while there were a few losses, there has been a net gain of 179. The business of the company during the year shows an increase of about 22 per cent. over the previous year.

During 1887 over $33 000 has been expended in new work, about $31,000 of that sum being the expense of changing the service. To give some idea of the cost of the apparatus, the manager of the exchange says that the new switchboard cost no less than $11,000. It is a model of elegance and convenience, and is now arranged to meet the demands of 1,200 Omaha subscribers, with an ultimate capacity of 5,000 subscribers. The woodwork is solid mahogany, and the interior a solid mass of wires, no less than 50,000 fine wires being necessary to its successful operation. It is, it is claimed, the most complete in the world outside of New York city, and with the extensions which are being and will be put to it, will meet all the demands to be made upon it. Before this board all day sixteen young lady operators sit answering the thousands of "hellos" and manipulating the keys and plugs which connect the different wires. In addition to these there are three night operators, two of whom remain until 10 o'clock, and the third all night.

The company keeps from 175 to 180 people constantly employed in various capacities, making an expense bill of no mean sum.

To keep abreast with the times the company is now supplying all of its offices with new transmitters, to be used in talking between towns.

During the past year the Nebraska telephone company has extended its outside lines to York and Fairbury, and have established exchanges at Norfolk and Lyons. During the coming year they will run a line to Hastings.

The company occupies five very elegant rooms in the fifth story of the Ramge block on Fifteenth and Harney streets. These are the operating room, private office of the Omaha manager, Mr. E. B. Smith, office of the secretary of the general manager, Mr. Blake, and bookkeepers' office. The company also has rooms for storage in the basement and an addition on the east of the building, where a number of men are kept constantly at work on repairs.

Adventures of a Train Dispatcher.

"I was," said the man with the wooden leg to a N. Y. *Sun* reporter, "station agent on the B. and R. Railroad for a good many years, and several things occurred there which were the talk of the line, and which you may find interesting enough to publish. My station was both insignificant and important. While it was only a hamlet in population, it was a railroad crossing. While every train seemed to be in a hurry to get away as fast as possible, all engines had to take water or coal, and various trains had to pull in on the long siding to let various other trains pass.

"The policy of our road was niggardly. The object was to get everything cheap, and to work every man to the limit. My station building was little better than a shed, and it was impossible to get any repairs or improvements. I was required to act as telegraph operator, ticket seller, freight agent, switchman, chore boy and all else, and did not have an hour I could call my own. I had a cot in the office, and was on call during the night. Let 'em sound my call while I was in the deepest sleep, and inside of twenty seconds I was ready to answer. I should have had a first-class assistant at my station but the company would not permit it. I must either do the work alone, or get out for someone who could and would, and so I kept hanging on month after month and year after year, always thinking about going, but never making up my mind to it. The situation was grave enough to keep my nerves under a constant strain. Train dispatching was not the art it is now, and if a regular got behind her time it caused confusion all along the line.

"One of the queer incidents occurred after I had had the station about two years. It was in the fall of the year, with a great deal of nasty weather, and trains were continually late. The last passenger train on our road passed me, according to schedule, at 10½ P. M. The next one passed at 7.20 A. M., and it was supposed that the intervening time belonged to me. If the night freight was on time, and if I did not get a call on the instrument, and if there was no special on the line, and if a dozen other things did not occur, I could sleep from 11 to 6. It may have occurred that my sleep was unbroken five nights in a year. On all other nights I was turned out from one to three or four times. The night freight should reach me at 12.05—five minutes after midnight. She never left nor took up a car at my station, leaving that for the day freight, but made a stop of seven or eight minutes for coal and water. If there was a special on the line, or if there had been an accident, the freight might have to side-track and wait, but such a thing was rare.

"As a rule, I was always asleep when the freight came in, but somehow or other I knew of her arrival. I knew of it without waking up, and next morning could have told whether she was late or on time. Twenty-eight minutes after her time a passenger train on the other road made the crossing. This crossing was eighty rods above the station, and, while I had nothing to do with the trains on the other road, I naturally kept track of them, and knew whether they were late or on time. On this particular night I went to bed at 10.45, and was asleep before 11 o'clock. At 12.20 I suddenly awoke. The night freight had not come in. I had been sound asleep, but I knew she had not. She was fifteen minutes overdue, and yet my call had not been sounded. This to me meant some sort of accident between me and the next station north, which was eleven miles away. I at once called for the station, but the operator had gone. I ran to the door and looked out. There was a fine rain and a dense fog.

"Freight trains are seldom on schedule time, and I had known those on our line to be an hour late without worrying over the fact. However, on this night I was all worry. The rain and the fog, the crossing, the fact of my waking up as I had, the failure to raise the agent at the station above these things made me terribly uneasy, and at 12.25 I lighted my lantern, put on my rubber coat, and started up the line on a run. I had not gone forty rods when I heard a hissing of steam, and two or three minutes later I could see the glare of a headlight through the fog. In a couple of minutes more I found our midnight freight—twenty-two loaded cars and a big locomotive—and she was standing directly on the crossing of the roads. I began to shout as soon as I had made out the locomotive, but no one answered me. I pushed along to the cab, climbed up, and found the engineer and fireman on the floor of the tender, arms around each other, and fast asleep or dead. At that same moment

the passenger train on the other road whistled for the crossing.

"I am telling you, sir, that I lived a year for every minute in the next five or six. I knew very little about an engine, though I had seen how they were reversed and how the throttle was worked. If anything was done I must do it, and do it quickly. Why I did not pull ahead I do not know. It struck me that I must back up, and I flung over the bar, gave her steam, and she began to move. The steam had run down, and we moved at a snail's pace, and even when I pulled her wide open the engine scarcely had power to back the heavy train We did move, however, although it was foot by foot. I could hear the roar of the passenger train, and I knew that every second was hastening a terrible calamity, but I did not leave the engine. Back! back! back! we crawled, and of a sudden a great light flashed in my eyes, there was a crash, and I saw cars moving in front of me and disappearing into the darkness. What had happened? Well, I had backed the freight until the locomotive of the passenger train only carried away the pilot as it crossed our line. That was all the damage done, and no passenger had a suspicion of his narrow escape from an awful smash-up

"When the train had disappeared and I could realize the situation, I began to investigate. I ran back to the caboose, but no one was to be found. I shouted and screamed, but soon found that I was all alone. Then, climbing back into the cab I sought to arouse the engineer and his fireman. Dead? No. Drunk as two lords? Yes, sir. They were drinking men, though the company did not know it. They had been taken off another run two weeks before, and coming down the line on this trip had brought a bottle with them. At the station above they had reached the limit, and in their drunken deviltry had suddenly pulled out and left all the train crew behind. The conductor could not readily find the station agent, and when he did rout him out and get him to the office I was out of mine, and did not answer his call. The two men had let the steam go down, and the train had crawled down to the crossing and been stopped where I found it. The men were by that time too drunk to stand up, and had grabbed each other and rolled on the floor to sleep. I was yet in the cab, trying to kick some sense into them, when the conductor and his two brakemen arrived on a hand car, and after getting up steam we got the train over the crossing to the station. The two drunkards ought to have been sent to State prison, but for fear of the story getting into the papers they were allowed to skip.

"How did I lose my leg? Well, there was a mystery about that. We had changed our time, and a passenger train passed my station at 2 A. M. I awoke one night at 1 o'clock feeling that the upper switch had been left open by the freight train I lighted my lantern and ran up there, and sure enough it stood wide open, and a death trap had been set for the express. I closed it, and was on my way back, when three cars which had broken away from the freight several miles away, at the top of a grade, came whooping down, and, in trying to get out of the way, I made a stumble and got my leg under the wheels. I dragged myself into the station and tried to call up the offices above me, but could raise no one. The cars were missed, and hunted for from one end of the line to the other, and, strangely enough, they could not be found. It was an odd thing to lose cars in that fashion, and before they got through searching, men walked over every foot of the line. It was six weeks before they were found. They had left the rails at a curve near a steep bank, and had gone over the rocks into a deep river without leaving a trace. It was as if they had been picked up and flung over by human hands. Being loaded with hardware, they had gone to the bottom, but the current rolled them along until they finally showed above the surface in a bend. When hauled out none of the three were damaged a cent's worth, but it was a deal of trouble to get them back to the rails again."

.... The new line of the Pacific Mutual Telegraph Company has been completed from Dubuque, Iowa, to Omaha. Next Monday the workmen will begin stringing copper wire between Lincoln and Omaha and Kansas City. This will be the first copper wire put up in this part of the country for telegraphic purposes. This new wire will greatly facilitate telegraph business between Kansas City and Nebraska towns, and between Nebraska and Chicago. Heretofore messages for Nebraska points sent over the Western Union wires have always been greatly delayed by the necessity of being relayed at Omaha, while Nebraska messages for Chicago and Eastern points have been relayed at both Omaha and Kansas City.

The English Telegraphs.

From the British annual report we learn that the first complete financial year during which the reduced rates for inland telegrams were in operation expired on the 31st of March, and it is interesting to note the effect upon the number of messages and upon the revenue. Separating the ordinary inland messages sent in that period from railway, press, official and foreign telegrams, which are not affected by the reduced rate, and of which there were over 10,000,000, it appears that the number of messages dispatched was 40,137,175 in 1886-7, compared with a total of 30,087,869 in 1885-6, and that the revenue produced was £1,354,879, as compared with £1,247,606 in the previous year, showing a growth over 10,000,000, or 33 per cent., in the number of messages, and over £77,000, or 6 per cent., in the revenue. This comparison, however, is not strictly fair, as the year 1885-6 continued six months at the one-shilling rate. A more accurate comparison may be afforded by taking the last six months of 1885-6 and the corresponding six months of 1886-7. This shows an increase of 2,333,745 in the number of messages, or 14 per cent., and of £75,670 in amount, or 13 per cent. The London local messages alone show an increase of 50 per cent., the total number being about 3,800,000.

Notwithstanding the rapid and satisfactory growth of the telegraph business, the expenses of the service far exceed the receipts, and the deficit, after including the interest payable for the capital borrowed, amounted to £469,840. The following table shows the deficit for each year for seven years:

1880-1	£984	1884-5	£302,767
1881-2	112,525	1885-6	371,554
1882-3	142,224	1886-7	469,840
1883-4	346,114		

The telegraphs were purchased by a loan of a capital sum of £10,880,671, of which the annual interest charge is £326,471. It will be seen from this statement that, even in a country of so narrow geographical limits as England, the government telegraph is conducted at a loss.

A Plucky Telegraph Operator.

A dispatch from Duluth, Minn., Dec. 28, says: "Over 100 quarrymen, who struck for the back pay due them, are engaged in a riot at the Hinsdale quarries, 40 miles north of this place, on the Duluth and Iron Range road. The last message received from James Lester, the operator there, reads:

"'The rioters have gained possession of the telegraph office. I have now a revolver on each side of my head. They have demanded the money in the safe and are trying to open it——'

"Here the message stopped and nothing has been heard since. Word was received from Tower that Deputy Sheriff Free has gone with a posse to the scene. The sheriff here was asked to go to the company's assistance, and he did so.

"Later—Deputy Sheriff Free, of Tower, arrested two of the rowdies and quelled the disturbance."

OUR KANSAS CITY LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

The East Fifth Street Railway Company, which had leased its tracks to the Electrical Street Railway Company, has now retaken possession of the tracks and is extending them. It will probably use mule power at the first, but if it can be satisfied that electricity can be made to do the work, electric motor cars will be placed in operation.

A short time ago the Commercial Club adopted a resolution censuring the management of the telephone exchange. This brought out a communication from the superintendent of the company. He said that the service in this city was as efficient as that in other cities. Moreover, he called to their attention the fact that the resolution did not set forth specific charges, so that they could be explained away or the wrongs remedied. He told them that there was a standing request to all subscribers to notify him of any neglect on the part of the operator, and that if the charges were made to him in that manner they could be very easily handled, and the wrongs easily corrected. He invited the members of the club to visit the exchange and examine its workings.

A very complete system of electric wires has been put in the new Watkins building, at Lawrence, Kan., under the supervision of J. E. Jeffries, of the Electric Construction Company. Over three miles of wire have been laid throughout the building. Every gas jet in the building will be lit by electricity, and extinguished in the same manner. "Buzzers" will be placed on every desk, twenty-six in number. When the telephone rings it also sounds an alarm which calls the office boy. The boy ascertains who is wanted, and by a compound push-button placed near the telephone, calls the right person to the telephone.

The Electric Construction Company is now furnishing electric apparatus in Garden City to the amount of $8,000. In the Sterns Hotel, a house containing 160 rooms, they are placing an improved annunciator, a fire alarm which sounds in every room in the house simultaneously, an electric gas-lighting system and a system of incandescent electric lights.

An interesting and enthusiastic meeting of the Electric Club, of St. Joseph, Mo., was held last Wednesday night. After the meeting was called to order the Committee on Constitution and By-Laws made its report, which was accepted, and the constitution and by-laws adopted. The regular meetings of the club for the discussion of electrical topics will hereafter be on Thursday evening of each week. The regular annual meeting for the election of officers for the ensuing year will be held on the first Thursday in January, at which time there will be elected a president, two vice-presidents, secretary, treasurer, and a board of six managers.

The Winfield, Kansas, Gas Company has let the contract for the building for its electric light plant. It will be on a lot near the gas works. It will be of stone, one-story high, and so arranged that another story may be added if necessary. It will have a frontage of 35 feet and a depth of 75 feet, and will be finished up in style.

On October 4, Springfield, Mo., contracted with its electric light company for a number of new lights, which were to be put up and in operation within 60 days. Up to date the company has taken no steps towards putting up any of the new lights. At the last meeting of the council this matter was brought up, as well as the fact that some of the old lights were not kept in operation regularly, and the clerk was ordered to put up the new lights at once, or forfeit its contract, and to operate the old lights regularly, or forfeit its pay.

"What has become of our talked-of telephone exchange?" asks a Garden City, Kan., paper: "The electric light plant will soon be put in, and why not at the same time have a telephone system? Such a convenience is necessary to the business men of the city. Cities of less importance than Garden City have systems in successful operation."

Chetopa, Kan., boasts of one of the finest electric light plants in the State. Everything about this plant is of the latest invention, and put in in first-class style.

Lightning struck the electric light building at Cherry Vale, Kas., last Saturday.

Cottonwood Falls, Kas., is soon to be lighted with electricity.

Telephone lines are being put up at Phillipsburgh, Kas.

At eight o'clock one night last week all the electric lights on the circuit of the business houses at Independence, Kas., suddenly went out. Lamps and candles furnished a poor light for the remainder of the night. Considerable time was spent in searching for the cause the next day, but it was not until late in the evening that it was found to be the breaking of a wire, where it passes through the branches of a shade tree.

The Larned (Kas.) Electric Company is putting in a large number of new street lamps, and has nearly doubled its capacity.

MURPHY.

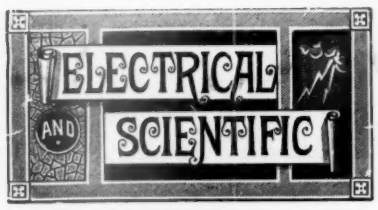
Kansas City, Mo., Dec. 26, 1887.

TELEGRAPHIC

.... The Boston Safe Deposit and Transit Company last week filed a complaint against the Bankers & Merchants' and United Lines Telegraph Companies, in the United States Circuit Court, for removing wires from poles. The Boston Safe Deposit and Transit Company, as trustee, holds certain stock of the American Rapid Telegraph Company, and the complainant alleges that the defendant companies are removing the wires of the American Rapid Company, which had been stretched upon the Bankers & Merchants' poles between Port Chester and Albany and Albany and Boston. Judge Lacombe granted a temporary order restraining the Bankers & Merchants' from transferring the wires.

.... The growth of the business of the Western Union Telegraph Company in Kansas City, Mo., during the past year, has been extraordinary, and places the city about the fifth in the United States as regards volume of business. During the year there were sent and received 847,991 messages, as against 693,160 in 1886, or an increase of 154,831. The repeated messages or through business, exclusive of associated press and specials amounted to 5,027,435 messages, as against 2,641,473 in 1886, or an increase of 2,385,962. By reason of the location of Kansas City and the facilities for handling business, the majority of the messages from the east to the west, or from the north to the south, pass through this office. On the first of 1887 the office had in operation one copper wire, but since that time two have been erected between this city and Chicago, one to St. Louis, one to Memphis and one to Denver. One new iron wire has been erected to Garden City, one to Leavenworth, one to Sedalia, one to Osawatomie, one to Marshall and six to city branch offices. On the first of the year, 1886, ten quadruplex instruments were used. This number was increased to sixteen last year. Five thousand nine hundred and seventy-seven cells of battery were used in 1886, and last year 8,486 or an increase of 2,509 cells. The operating room has been enlarged and a splendid new switchboard placed in position which greatly facilitates business. The regular operating force has been increased thirty-five men, besides the substitutes.

. Experiments which have been already made prove decisively that a man's weight can be supported by planes or sails of very moderate extent—not much greater proportionally to his body than an eagle's wings—if only there is either rapid motion of advance or a strong current of air against their slightly slanted surface. But these experiments have not yet been so carried on as to show fully what can be done when practice in the art of balancing in the air, and in making the adjustments necessary for changing the direction of flight, has been sufficiently extended. Yet Mr. Charles Spencer, a teacher of gymnastics in England, was able, after attaining no greater velocity than would be given by running down a small incline, to sustain flight by the supporting action of wicker wings for a distance of 120 feet. Besnier, indeed, toward the close of the century, devised a method of supporting the body by pinions, which enabled him, after a sharp run, to fly across a river of considerable width. Such experiments, extended by using either gravity or some motive force to give greater velocities before flight is commenced, can be conducted with perfect safety. They could be made to develop most interesting and striking results if carried out by athletes, insomuch that as mere performances they would be attractive and would fully repay any time or trouble devoted to them. And, as soon as men had learned to float in this way, they could readily adopt such mechanical devices as would suffice to give them propulsive power and to turn floating into flight.



* * The Brush Electric Company, Cleveland, Ohio, has opened offices in this city at 36 Union square, east side. Mr. W. F. Swift, secretary of the company, will be in charge.

* * The New York branch office of the Baxter Motor Company has just moved into new and extensive quarters in the Potter building. Mr. T. McCoubray is in charge of this territory.

* * The Bellevue & Davis Island inclined plane R. R. of Pittsburgh, Pa., is now run by electricity. The Fisher system, manufactured by the Detroit Electrical Works, is used, and working satisfactorily.

* * Mr. J. W. Burdette, secretary and treasurer of the Electric Light Company at Burlington, Iowa, states that the company has purchased supplies for an incandescent plant, and as soon as possible lines will be run and the plant operated.

* * As a result of the way Col. N. W. Pratt stood by his colors, the following is published without prejudice: We had a dinner with N. W. Pratt over last week's item, and the *crow* was enjoyed as much as that delicate bird generally is.

* * The many friends of Mr. H. T. Edwards, formerly of Mitchell, Vance & Co., will be glad to know that he has opened an office at 224 Canal street, and is now prepared to furnish electroliers and other electrical appliances of that description.

* * Says the Philadelphia *Ledger:* "That the electric light companies should have agreed to continue lighting the streets should be taken as an evidence of their disinterested goodness. If they had consigned the city to outer darkness for a week, they might have commanded their own terms. Now that we have grown accustomed to electric lights on the main thoroughfares, the feeble gas lights would no longer be tolerated."

* * Six years ago Ernest K. Williamson robbed a Fall River firm of $40,000 and fled. The other day a traveling photographer took a picture of a group of ranchmen in Homerville, Neb., and was afterward arrested in Chicago. Among his traps was the negative of the photograph, and a Pinkerton detective recognized Williamson in the group, and went to Homerville and arrested him.

* * A new accumulator, the anode of which is formed of a plate made from a mixture of powdered carbon and lead oxide, has been brought out by Messrs. Hafner and Langhaus. The cathode consists of a layer of mercury in a shallow insulating dish. The element is formed by placing a series of these dishes one above the other and connecting them so as to form a single electrode.

* * The Sprague Electric Railway and Motor Company has recently issued a series of interesting and instructive pamphlets relating to the numerous uses of electric power. Electricity as a motive power in mining work is treated of at considerable length, and in this field the Sprague Company is doing a magnificent business. There are also completing electric railways in Richmond, Va.; St. Joseph, Mo., and some half dozen other cities.

* * Mr. Alexander Watt, the author of several valuable works on metallurgy, has given in our London namesake the results of a great number of experiments with that interesting metal, cobalt, and has endeavored to explain the probable reasons why cobalt has not received much recognition at the hands of the electro-plater. From Mr. Watt's point of view, this metal should take its place as a substitute for nickel for coating various articles—its superior whiteness, and the readiness with which it may be deposited by electricity, being urged in its favor.

The Miller Arc Lamp.

This ingenious lamp has several features which merit notice as among the novelties of the day. It is a focusing lamp by reason of its construction, as will be observed. The accompanying cut fully illustrates the special form and construction. The lamp has no carbon rod, but the clutch used takes hold of the positive carbon directly, and the result is a great shortening of the length of the lamp, thus adding to its symmetry, and fitting it especially for low ceilings and interiors generally. The negative carbon is contained in a tube surmounted by an iron claw having its prongs curved slightly inward, and the carbon is continuously pressed upwardly against this abutment claw by a spiral spring under the carbon. The spaces between the claws allow of the combustion or wasting of the carbon, which is therefore always kept pointed as it should be, and the light is always at the one spot. The inventor says:

"By my construction of lamp and arrangement of parts I may decrease the length of lamp to nearly one-half of those in ordinary use, or I may employ an electrode of twice the length, and thereby double the interval of time between recarbonings. A usual length of lamp, as lamps are now made, is fifty-four inches, and the length of positive carbon consumed nine and one-half to ten inches. This length of lamp I reduce to twenty five inches, consuming same length of carbon, or to forty inches, consuming eighteen inches of positive carbon."

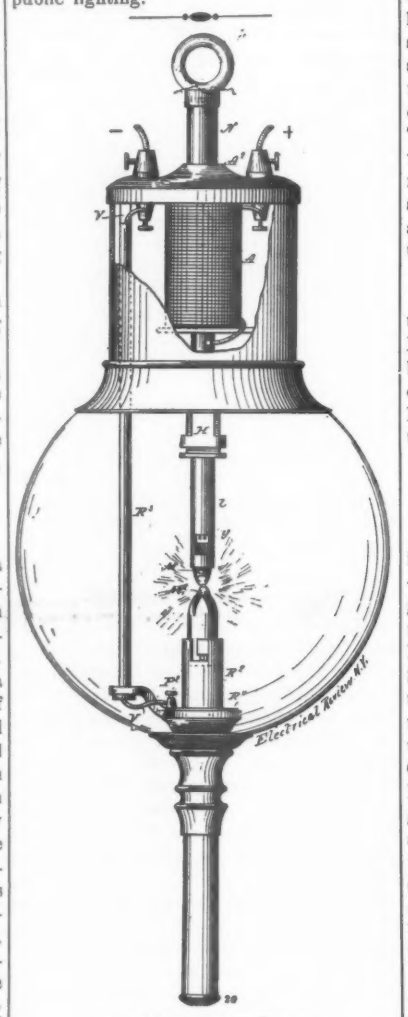
We have seen a number of these lamps in operation, and can say that while being unique and very ornamental in appearance, and preserving a constant focus, and having no carbon rod whatever, their performance was exceedingly fine. There was a total absence of both hissing and flaming, and the lamps could not, by any of the usual tricks, be induced to "pump."

A New Explosion of Gas.

In this article is described something a little out of the electric line—a gas burner—but if the claims made for it are borne out in practice, it is a matter of interest to everyone engaged in exploiting the electric light. The apparatus is very simple, consisting of a T-shaped burner, provided with a row of perforations on its upper side. Suspended above the line of gas holes is a flattened coil of wire, composed mainly of magnesia—an extremely refractory metallic oxide. When the gas is lighted the coil becomes brilliantly incandescent over the whole surface, we are assured, and continues to glow, with a perfectly steady light, as long as the burner is supplied with gas. The burner is the invention of Mr. Chas. M. Lungren, of this city, who some three years ago brought out a regenerative gas lamp which has had a large success. Viewed simply as a gas burner, designed to be used with the ordinary gas supply, it would hardly call for mention here. Its interest to the electric light man resides in what it implies. Behind this comparatively simple contrivance there stands a scheme of very large proportions—nothing more or less, in fact, than the universal substitution of fuel gas and incandescent gas lighting for the present methods of heating and lighting. The claim is made by the projectors of this enterprise that, with fuel gas sold at a price at which it can compete with coal for the purpose of house heating, the cost of this light to the consumer would be below that of any present form of light, even kerosene. They make the further claim that, in the very nature of the case, it must continue to hold such a relation, as both electricity and gas depend ultimately upon fuel of some kind, and gas can resort to cheaper and cheaper fuel, as it becomes necessary, with greater facility than electricity. Those interested are very jubilant, therefore, over the prospects of the burner. Although this burner is about to be brought out now for the first time, the work of Mr. Lungren in this field goes back a considerable period, and we understand him to make the claim that, under his patent, he holds broadly all forms of burners in which the incandescing material is in the form of a filamentary body of refractory earth. This will be of particular interest to other parties who are interested in promoting rival lamps of the general class to which this belongs. We understand that Mr. Lungren is about organizing a company and expects to have the lamp on exhibition in this city very shortly.

Public Electric Lighting in Philadelphia.

Director Wagner is reported as saying that all the companies furnishing electric lights to the city had agreed to his proposition that they continue for three months, more or less, to furnish the lights upon the basis of the bids recently made by them for the year 1888. He said that all of the recent bidders except the Keystone Company are now furnishing lights to the city. The bids have been referred to the city councils by the electrical committee, at Director Wagner's suggestion, and he expects that within three months the councils will take action on them. Chief Walker, of the Electrical Bureau, says that, although the Keystone Company has not the "plant" wherewith to light that portion of the city for which it has made a bid of 35 cents a light for each night, he is inclined to think that the Director could award the contract to that company, in view of the fact that a resolution of councils authorizes the Chief to permit the erection of poles and wires for public lighting.



THE MILLER ARC LAMP.

—— Messrs. Wickes Bros., of East Saginaw, Mich., the large manufacturers of gang saws and lumber machinery, have put in a large Schuyler plant and do not hesitate to say that it gives most perfect results and saves money.

—— The work of utilizing the fine water-power at Sault Ste. Marie by the Edison Sault Light and Power Company is being watched with great interest. Mr. B. B. Powell, the secretary and general manager of the company, states: "We are making a canal two thousand feet long to conduct the water for power to our station. The canal will be ready to let the water in about Dec. 30. We have our dams completed and penstocks that will accommodate wheels to furnish 1,800 horse power. We are building a stone station 60 × 74 feet, with concrete floor and truss roof for a dynamo room. This, with asbestos roof, will make nearly a fireproof building. Our wheel house is 16 × 74 feet, placed at an angle of 60 degrees, to admit of shafting, so arranged that each pair of dynamos will be independent of the others. The water wheels to get started (two in number), pulleys, shafting, gearing, etc., have been shipped from Dayton, Ohio. This station is being built as much for the purpose of furnishing electric power as for light, and having Lake Superior with its 32,000 square miles of water to draw from, we consider it safe to make contracts to furnish either large or small powers, regardless of cold weather."

A Remarkable Exhibition of St. Elmo's Fire.

A remarkable exhibition of St. Elmo's fire was recently witnessed by the writer on the summit of the Sonnblick mountain in Austria, about 10,000 feet above sea level.

The synoptic weather chart for September 9 shows that there was at the time a ridge of high pressure over Central Europe, with light and variable winds at the low-level stations. On the Sonnblick it had rained all day, with a southwest to a southerly gale. The pressure, which was high (nearly 20.7 inches, the normal being about 20.3 inches), was falling irregularly, and the temperature was about 37° Fahr. About 6 P.M., with a sudden shift of the wind to the north, the pressure rose and the temperature fell to 30° Fahr., causing the rain to change to sleet and snow. About this time brushes of violet light were noticed outside the observatory upon the points of the lightning-rod, the anemometer cups, etc., and even upon projecting pieces of rock. From the heads of the observers and from their outstretched hands similar brushes of light streamed (resembling the positive discharge from an electric machine), accompanied by a crackling noise and a prickling sensation. This continued until the wind, which meanwhile had fallen to a calm, changed its direction to southwest and the pressure became stationary. The temperature soon rose above the freezing point, but the snow continued to fall for some hours. R.

—— A new electric light company, under the name of the Electric Light, Power and Manufacturing Co. of Dallas, Texas, has been organized. Capital is $50,000. This company bought out the old Texas Electric Light and Manufacturing Co. It is the intention to enlarge the plant considerably.

Burdette's Experience with Western Electricity.

In all the great, throbbing, pulsing, growing, booming West, there is one slow thing—lightning. My experience with the telegraph lines was slow, and to me very expensive. About 4 o'clock one day, at Topeka, I confided to the Santa Fee, Colorow and Solar System Telegraph Company a telegram to Chicago, one to Parsons, Kan., and one to the Coates House, 66 miles away, telling the landlord to have my rooms ready at 6.15. The telegram reached the Coates after I had eaten and digested my supper and had gone to bed. The other one reached Chicago some time the same night, and I don't know what became of the one to Parsons. And several other times I tried the telegraph, but only to be convinced that I could have the message delivered a few hours earlier by sticking a special delivery stamp on it and taking it along with me.

All the trains in the West have fast names and slow wires. Possibly this makes the telegraph seem slower than it really is. And do you know, it is much harder to wait for a fast train than it is for a slow one. It is irritating to waste one's life at a station and hear an impatient freight conductor extract information from the station agent.

"How's the Cannon Ball?"

"Four hours late."

"How's the Flyer?"

"Three hours late out of Denver."

"How's the Thunderbolt?"

"Abandoned."

"How's the sleeping Crab?"

"She's running on the Incandescent Thunderbolt's time to-day; went by without stopping, two hours ago."

But the land of Kansas is a wonder. A town no bigger than a voting precinct will have street cars and electric lights and corner lots. It just makes a man's back ache to look at Wichita. Street car lines running twenty miles out in the country. Six universities going up. The very ground a-quiver with excitement and growth. Different from anything you ever saw in all your life. Everything booming except the saloons. Shows that you can boom a town clear up into the millions without the aid of one whisky shop. The old idea was that when you boomed a Western town you started in with a saloon every other door and a church or two came along by and by. In Wichita you stumble over the churches and get tangled up among the colleges and lost in the labyrinth of "Homes" and Reading Rooms, but you have to sneak around and learn the ropes and lie a little to get a drink. And yet the boom goes on.

Western Rates to Electric Light Convention.

Mr. Geo. S. Bowen, of Elgin, Ill, will make arrangements for reduced rates for the western delegates to the February convention in Pittsburgh. All those desiring to attend the convention will please communicate with Mr. Bowen at once. There should be a large attendance from the wide-awake West, where so many electric light and power companies have been formed during the past year.

Electric Lighting in Ohio.

Recently the city council of Mt. Vernon, Ohio, sent out a circular letter to gain information on the electric light question, and from the answers the following points are made:

In the circular the following questions were propounded:

1. Does your city or a private company operate the plant?
2. If the former, what system is in use, and what was the total cost of plant?
3. How many arc lamps are used to light your city, and what is the cost per year of each arc light?

Any further information you may give in regard to details will be greatly appreciated.

Thanking you in advance for the favor, and hoping you may find it convenient to submit an early reply.

Nine cities out of eleven were heard from, and the information derived may be summarized as follows:

Alliance, Ohio—By private company; Western Electric Light Co.'s system; one street lighted with eight arc lamps, at $12 per light per month, and burn all night.

Defiance, Ohio—By private company; Western Electric Light Co.'s system; fifty-two arc lamps, at $60 per year per lamp.

East Liverpool, Ohio—By private company; Western Electric Light Co.'s system; cost of plant about $15,000; thirty-two arc lamps in use; first twenty-five lamps at $85 per year, balance at $80 per year. Light gives good satisfaction Lamps are swung at intersection of streets, and outside of business portion we alternate at each intersecting street, using the cable system.

Mansfield, Ohio—By private company; Western Electric Light system; seventy arc lamps in use, at $75 per lamp per year. More have been added since this report.

Massillon, Ohio—By private company; Schuyler Electric Light system; eighty lamps, 2,000 candle power, $70 per year per lamp.

Norwalk, Ohio—By private company; Western Electric Co.'s system; eighty-two arc lamps used, at $70 per lamp per year.

Painesville, Ohio—By private company; Western Electric Co.'s system; fifty-five arc lamps used, at $72 each per year. The lights give general satisfaction, and are a great improvement over lighting by gas, with very little, if any, additional expense.

Steubenville, Ohio—By private company; we have about 150 incandescent lamps around the suburbs, each twenty-five candle power, for which we pay $20 per year for each lamp.

Sandusky, Ohio—By private company; Brush and Western Electric Co.'s system; 125 arc lamps of 2,000 candle power each; we pay $82 for each arc light per year; contract extends for one year.

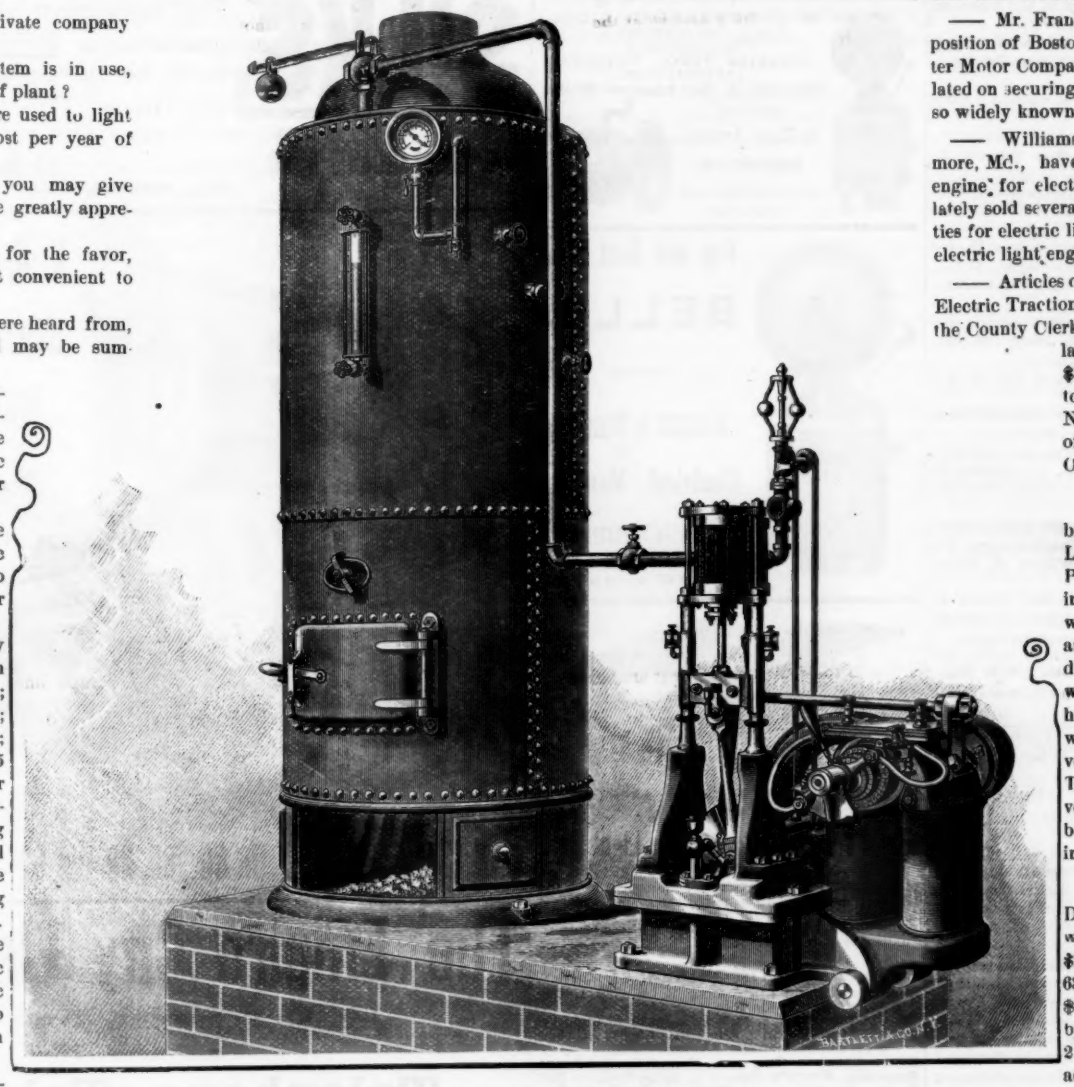
In the cities enumerated the plants are all operated and owned by private companies. The rate for an arc light runs from $60 to $144 per year.

At Portsmouth, with a population of 13,000 and an extensive territory, the city owns a Thomson-Houston plant which cost $18,000. There are ninety-three lamps of 1,200 candle power each in use, each lamp costing but $38 per year. The city does not use either gas or oil for street lighting purposes, but burns the electric light whenever necessary, early and late, as the occasion may require. The citizens claim that Portsmouth is the best and cheapest illuminated city of its size in the State.

WHAT OTHER CITIES PAY.

In Ft. Wayne the electric light company furnishes that city with lamps at $135 per year, and at Peoria the city pays $2,140 per year. Other cities pay as follows: Albany, $182 50; Rochester, $164.25; Boston, $237.50; Baltimore, $255; Buffalo, $200.75; Evansville, Ind., $200; Philadelphia, $200 75; Pittsburgh, $200; Cleveland, lower lights, $172.50; Cleveland, towers, $400; Grand Rapids, $173; New Orleans, lower lights, $145; New Orleans, towers, $200; Davenport, Iowa, $190; Detroit, old contract, $182.50; present contract, over $187 per light.

Of course, these figures are for lamps that run all night and on moonlight nights when it is cloudy or rainy.



SAWYER-MAN ELECTRIC AND STEAM PLANT COMBINED.

Electric and Steam Plant Combined.

The application of electric lighting in many instances calls for special and unique arrangement of dynamos and engines. The electrical engineer is always expected to be equal to any emergency that may arise, and this faith is generally not misplaced. In the accompanying engraving is shown a dynamo, boiler and engine, as set up by the Sawyer-Man Electric Company, occupying a very small space. The view given will be interesting, as showing what can be accomplished where room is so limited, such as on shipboard, in residences, and in numerous manufactories.

—— The Morristown Electric Light Company, Morristown, Tenn., has been granted a five-year franchise by the mayor and aldermen.

—— The electric light is evidently to play a great role at the Paris Exhibition in 1889, says *Invention*. The Commission of Control and Finance decided at last sitting that the exhibition should be open in the evening and lighted with the electric light The entrance fee in the evening will be two francs, of which one franc is to be paid to the electric light companies that will illuminate the buildings and grounds These companies will continue to receive half the entrance money paid in the evening till the total thus received amounts to 2,000,000 francs, after which the State will share in the profits This arrangement, which was adopted by 17 votes against 8. was hotly opposed by M. Christophle. in the name of the Society of Guarantee. By an article of the law relative to the Exhibition the whole of the receipts till a certain amoun is reached belong to that society. M. Christophle, therefore, claimed for his shareholders all the entrance money. It was, however, pointed out by MM. Alphand and Prevet that the interests of the Guarantee Society would suffer no injury, since when it was agreed that that company should receive the whole of the entrance money, there was no question of opening the exhibition in the evening, and that an entirely new source of profit had been created by doing so by the aid of the electric light, the establishment of which would cost the two millions demanded by the electric companies. On the proposal of M. Dautresme, Minister of Commerce and Industry, it was further decided that a special commission should investigate the contracts to be made with the various electric lighting companies.

—— The Jamaica, L. I., Electric Road Company completed the laying of the water pipe from Woodhaven lane to their engine house last week, and now have a sufficient water supply for their boilers, and the cars on the road commenced running regularly between East New York and Jamaica.

—— Holland, Mich., has decided in favor of electric lights.

ELECTRIC LIGHT NEWS

—— The Curtis damper regulator is in use on a number of boilers in electric light plants.

—— The C. & C. Motor Company has several motors in use in connection with the Silsby pump, which are giving fine satisfaction to patrons.

—— Eight of the new electric light towers in Utica, N. Y., have been erected, and the other will go up this week. Less than twenty mast-arms remain to be placed in position.

—— Mr. Frank Ridlon has accepted the position of Boston representative of the Baxter Motor Company, which is to be congratulated on securing the services of a gentleman so widely known in New England.

—— Williams Engine Company, Baltimore, Md., have sold to Boston parties an engine for electric lighting, and have also lately sold several engines to Baltimore parties for electric lighting. These are the first electric light engines built in Baltimore.

—— Articles of incorporation of the Julien Electric Traction Company were recorded in the County Clerk's office at Newark, N. J., last week. The capital is $3,000,000, and the incorporators are William Bracken, of New York; L. Willoughby, of Philadelphia; and Edward O. Coles, of East Orange.

—— George Christian brought suit against the Louisiana Electric Light and Power Company for personal injuries resulting from contact with an electric light wire, and the jury gave him a verdict of $840. The plaintiff was sitting on a balcony, and his hands came in contact with an electric wire, severely burning his hands. The Judge, in approving the verdict, urged that more care be exercised by electric lighting companies

—— In the city of Buffalo, December 1, 1887, there were 6,783 gas lamps, costing $22 64 each per year, and 639 electric lights, costing $173.37½ each per year, in use by the city. From December 2 to December 29, 1837, 241 additional electric lights were ordered by the common council, which increased the cost of street lighting about $14,000 per year, allowing five gas lamps displaced by each electric light. Some of the local papers are agitating the question of the city owning its electric light plant.

—— In the contract between the city of Utica and the New York Electric Construction Company, signed November 3d, it was specified that the company should perform the work required therein to the entire satisfaction of a committee, to be appointed by the mayor on or before January 1, 1888. In accordance with this provision, Mayor Kinney named the following committee: P. J. Shaughnessy, Walter L. Middleton, George E. Dunham, George C. Hodges, John C. Schrieber, William T. Baker, Fred G. Chamberlain. A majority of the members of said committee shall have the right to require additional lights whenever and wherever, in the city limits, they shall deem the same necessary, prior to the 15th day of June, 1888, after which last mentioned date such additional lights may only be required by the request of two-thirds of said committee, exprpssed in writing to the company The company is to receive no compensation for said lighting until the same is done to the satisfaction of said committee; and expressly waives all claims for damages arising from the committee's reports whenever presented, provided the same shall be unfavorable.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JAN. 3, 1888

375,727 Electrical synchronous movement; Henry C. Bridger, New York, N. Y., assignor to Josiah Quincey and A. L. Parcelle, both of Boston, Mass.

375,749 Permanent magnet for electrical apparatus.

375,750 Armature for magneto-electric machines.

375,751 Magneto-electric machine; William Humans, Cambridge, Mass., assignor to the American Magnetic Electric Company, Jersey City, N. J.

375,766 Telegraph register; Joseph G. Noyes, New York, N. Y., assignor to the New Haven Clock Company, same place.

375,784 Apparatus for electric welding; Elihu Thomson, Lynn, Mass.

375,835 Electric exercising machine; Edward W. Robinson, Charles H. O'Brien, and Howard M. Breen, Portland, Me.

375,862 Telephone; V. Maximilian Berthold, Cambridge, assignor to the American Bell Telephone Company, Boston, Mass.

375,876 Conduit for electric conductors and power cables; Isaac La Rue Johnson, Washington, D. C.

375,898 Duplex telegraphy; Charles Selden, Baltimore, Md.

375,910 Regulating alternate current electric generators; Karl Zipernowsky, Buda Pesth, and Maximilian Deri, Vienna, Austria-Hungary.

375,915 Electrical heater; John P. Barrett and Jacob F. Mehren, Chicago, Ill.

375,925 Telephone system; John Crawford, Reading, and John B. Ker, Harrisburg, Pa.

375,952 Covered or insulated wire or conductor; Leonard F. Requa, New York, N. Y., assignor by mesne assignments to the Safety Insulated Wire and Cable Company.

375,977 Supporting arm for electric lights; Daniel B. Banks and George K. Hutchins, Baltimore, Md.

376,007 Electric arc lamp; William H. Miller, New York, N. Y.

376,018 Electric therapeutic device; Edwin R. Whitney, St. Johnsbury, Vt., assignor to the Standard Electric Company, of Vermont, same place.

376,019 Mold for forming pieces of carbon for electric purposes; Charles H. Wilder, Natick, Mass. assignor to the Hub Carbon Company, Kennebunk, Me.

BUSINESS NOTICE.

THE BRUSH ELECTRIC COMPANY,
CLEVELAND, OHIO.

NEW YORK, Dec 22, 1887.

We have opened offices in New York at No. 36 Union Square (East Side), for the transaction of business in the Eastern territory, formerly occupied by the Brush-Swan Electric Light Company, of New England.

We shall within a short time have in operation our New England supply room, through the medium of which we can furnish small supplies directly from New York to our Eastern customers, who may be in haste for them, with greater promptitude than they can be obtained from our works in Cleveland.

All orders for Brush electric light apparatus and supplies from parties in the former Brush-Swan territory should be sent to

WM. F. SWIFT, Secretary,
No. 36 Union Square,
New York City, N. Y.

A Link Belt Testimonial from the Edison Electric Illuminating Company.

NEW ORLEANS, LA., Dec. 22, 1887.

Messrs. Chas. A. Schieren & Co., New York.

Dear Sirs: I am in receipt of your inquiry as to our experience with the Link Belt which you send us on trial.

I have great pleasure in saying that it has given, and is giving, the greatest possible satisfaction.

I was greatly surprised on coming to this country in 1885 to find that Link Belts were unknown, as I had had three years' experience with them in England, where the Edison Company, and nearly all the other companies, had adopted them and used them exclusively for all plants of any considerable size.

As long ago as January, 1883, we tried the first Link Belt on an Edison plant in London, of which I was then in charge, and it gave such satisfactory results that they were immediately adopted, and the second order was for the most important plant the Edison Company then had—viz.: the Houses of Parliament. Subsequently the plant was enlarged and Link Belts were put all through and are running to this day.

It is well to bear in mind that these results were obtained with the old-fashioned Link Belt with the straight iron rivets right through. Your patent American joint in the center is, of course, a great improvement, as we do not have to wait until the rivets become concave by wear.

I was very glad to hear in June last from your Local Agents that you were prepared to supply Link Belts, as they were just what I had been waiting for.

Our belts here run about 4,500 feet per minute and transmit about 75 horse power, and, although this is a severe test, I have seen them doing still harder work, and traveling at higher speeds, with the best results.

Suffice it to say that as soon as our other seven belts wear out I shall replace them all with Link Belts, for the reason that, besides doing better service, with much greater reliability and far less strain on the bearings, I have found that they will outlast three or four ordinary leather belts.

Since your link belt has been running here it has been the wonder and admiration of all the electric light men and practical machinists who have seen it.

We are now putting in an additional engine, and shall be glad if you will send us for the same two Link Belts, same as last supplied, one to be 48 feet and the other 53 feet long. Each 10 inches wide.

You are at liberty to make any use you may desire of the above, and I shall take great pleasure in recommending your Link Belts to any inquirers.

Yours very truly,
For THE EDISON ELECTRIC ILLUMINATING CO.,
WM. T. M. MOTTRAM,
Superintendent.

William Marshall,
Manufacturer of ELECTRICAL CONDENSERS
STANDARDS A SPECIALTY.
Rooms 2 and 4 University Building.
Corner Waverley and University Places, New York.

W. R. OSTRANDER & CO.,
21, 23 & 25 ANN STREET, NEW YORK.
Manufacturers of
SPEAKING TUBES, WHISTLES, ANNUNCIATORS,
Electric & Mechanical Bells.
FACTORY,
De Kalb Avenue,
BROOKLYN.
Send for Illustrated Catalogue.

Bug and Dust Proof
BELLS.
Hazazer & Stanley,
Electrical Man'f'rs,
32 and 34 Frankfort St.,
NEW YORK.

WE GLADLY TESTIFY to the SUPERIORITY of the
MUNSON
Eagle and Dynamo Electric Light Belt.
The stretch, otherwise than the elasticity, is removed, no rivets and perfect evenness in heft, the result noiseless with a perfect motion, which is absolutely essential for a steady light. We use no other make. The character and responsibility of the house is unquestioned.

TESTIMONIALS.
Western Edison Light Co., H. WARD LEONARD, General Sup't.
W. J. Buckley, Mgr. Ft. Wayne Jenny El. Light Co.
Thomson-Houston Electric Light, Herbert Wadsworth, Manager Western Office
Brush Electric Co., Alex. Kempt, Special Agent.
Excelsior Electric Co., C. J. Reilly, Western Mgr.
Sperry Electric Light Motor & Car Brake Co., 901 Royal Insurance Building
J. H. Reid, General Manager of the Mather Electric Light Co., Chicago.
Wm. H. Purdey, Comm. of Public Works, Chicago
John Mab, Chief Engin'r of Board of Trade, Chic.
C. J. Melmes, Gen'l Sup't Thomson-Houston Light, Omaha, Neb.
J. A. Corbey, St. Joe Electric Light and Power Co., St. Joe, Mo.
Wm. Oswald, Agt. Edison Light Co., New Orleans, La.
OFFICE AND FACTORY,
240 & 242 RANDOLPH ST., CHICAGO.

Detroit Electrical Works

MANUFACTURERS OF

ELECTRIC SUPPLIES,

INCLUDING

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INSULATED MAGNET, TELEPHONE AND ELECTRIC LIGHT WIRE.

GENERAL OFFICES and FACTORY:
DETROIT, MICHIGAN.

SILKS. Full assortment of different sizes and qualities on BRAIDER SPOOLS, ready for the machines, in Red, Yellow and Green. Other colors to order.

SEND FOR SAMPLE AND PRICES.

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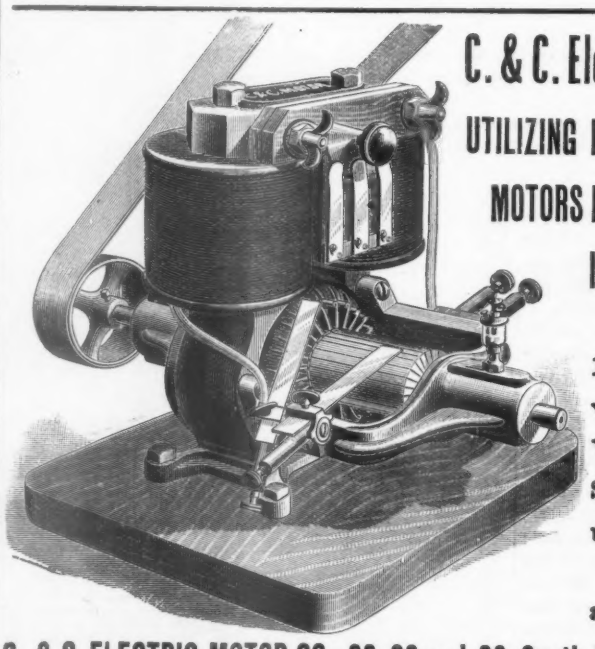
MILL, YONKERS, N. Y.



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UTILIZING IN SMALLEST MOTORS LATEST DYNAMO IMPROVEMENTS.
Automatic Motors, or with the Wheeler Safety Regulator.
Wound for any circuit.
C. & C. ELECTRIC MOTOR CO., 88, 90 and 92 South Fifth Ave., N. Y.

The Empire City Electric Co.,

15 Dey Street, New York,

Manufacturers of

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AND

ELECTRIC LIGHT SUPPLIES.

WRITE FOR PRICES.

GONDA (FORMERLY PRIEM) CELL, COMPLETE.

Leclanché,
The Standard Open-Circuit Batteries of the World.
GONDA and DISQUE,
The Only Genuine Leclanché Batteries
Are those which bear this LABEL and the Trade-Mark, GONDA.
DO NOT BE IMPOSED UPON BY IMITATIONS.
If dealers have not the Genuine Battery, send direct to us for Price-List.
THE LECLANCHÉ BATTERY CO.,
140 West Eighteenth Street, New York.

GENUINE DISQUE CELL, COMPLETE.
The Porous Cell also bears Label.